MITSUBISHI ELECTRIC
Changes for the Better

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Programmable Controllers
C Controller Quick Start Guide

Let's start C Controller!

Smart & Easy

A simpler and more sophisticated integrated-system platform is now available with the C Controller.

HOW TO READ THIS GUIDE

The following table lists symbols used in this guide with descriptions and examples.

Symbol	Description	Example
	Shows information you need to know.	The C Controller module executes program operation regardless of the switch status (RUN/STOP).
	Shows reference manuals and pages on which you can find the details.	Refer to the following. ☞ C Controller Module User's Manual (Hardware Design, Function Explanation) : SH-080766ENG
	Shows the explanations of terminology.	Buffer memory: The memory of an intelligent function module used to store data (such as setting values and monitored values) for communication with a C Controller module
	Shows descriptions that must be noted.	Power off the system before mounting a module.
[ ]	Menu names on the menu bar ([ ]→[ ] shows drop-down menus.)	Select [Project]→ [Properties].
	Buttons on the window	 button
	Keys on the keyboard	 key

INTRODUCTION

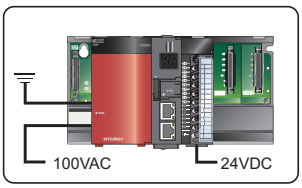
This guide simply explains the basic operations of a C Controller module for the first-time users of the Mitsubishi programmable controller MELSEC-Q series C Controller module (hereafter abbreviated as C Controller module).

This guide is targeted for users who use the MELSEC-Q series for the first time and are in the following situations:

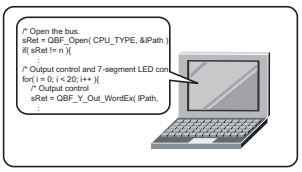
- Users with experience in C language or C++ language programming
- Users considering to replace the microcomputer board or the personal computer system with a C Controller system

Quick Start Guide

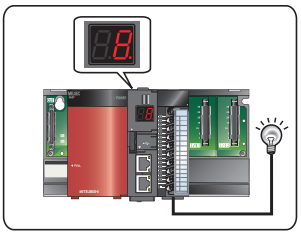
Mounting and wiring modules



Creating programs



Checking operations



All information is included!

Reference

● Precautions

For safe use of the C Controller module, read "SAFETY PRECAUTIONS" in the C Controller Module User's Manual.

Caution

This guide explains operations using the system configuration in "<2> System Configuration" (P.15).

When designing/operating a system, refer to the manuals listed in the following.

☞ "RELATED MANUALS"(P.12)

CONTENTS

MEMO

OPERATIONS THAT CAN BE PERFORMED USING C CONTROLLER MODULE

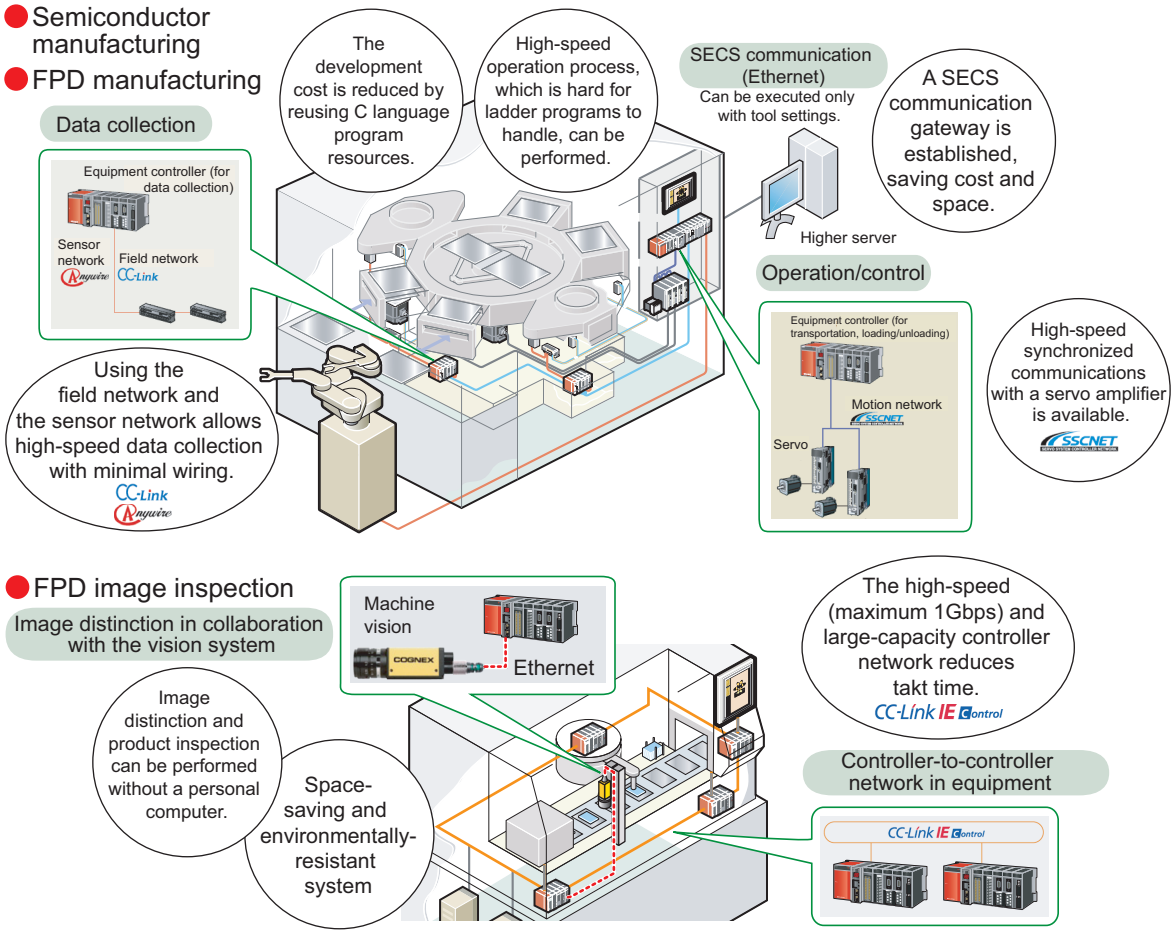
■ Sophisticated and high-speed processes and communications with the higher server

A C Controller module is a CPU module that supervises MELSEC-Q series modules and controls I/O devices using C language or C++ language program. This module also can:

- Reuse a C language or C++ language program developed under a microcomputer board and personal computer environment.
- Perform sophisticated and high-speed operation process, which is hard for ladder programs to handle, required in the fields such as manufacturing of semiconductor products, FPDs, and solar cells; and remote monitoring of public infrastructures (e.g. electricity, gas, and water systems).

The C Controller module easily achieves various functions using user programs.
Combined with partner products, the module can also perform the following functions.

- Program-free SECS communication commonly used for semiconductor manufacturing and direct communication with the higher server without a gateway personal computer can be executed through a SECS communication software package.
- In collaboration with a vision system, image distinction and product inspection can be performed without a personal computer.



■ Various functions for real-time control

The C Controller module equips VxWorks (Wind River Systems, Inc.), real-time OS with many achievements and high reliability (The runtime license does not cost).

Since VxWorks supports a preemptive system*1, allowing real-time operation and sophisticated process that require an interrupt and punctuality, which may not be ensured under personal computer environment.

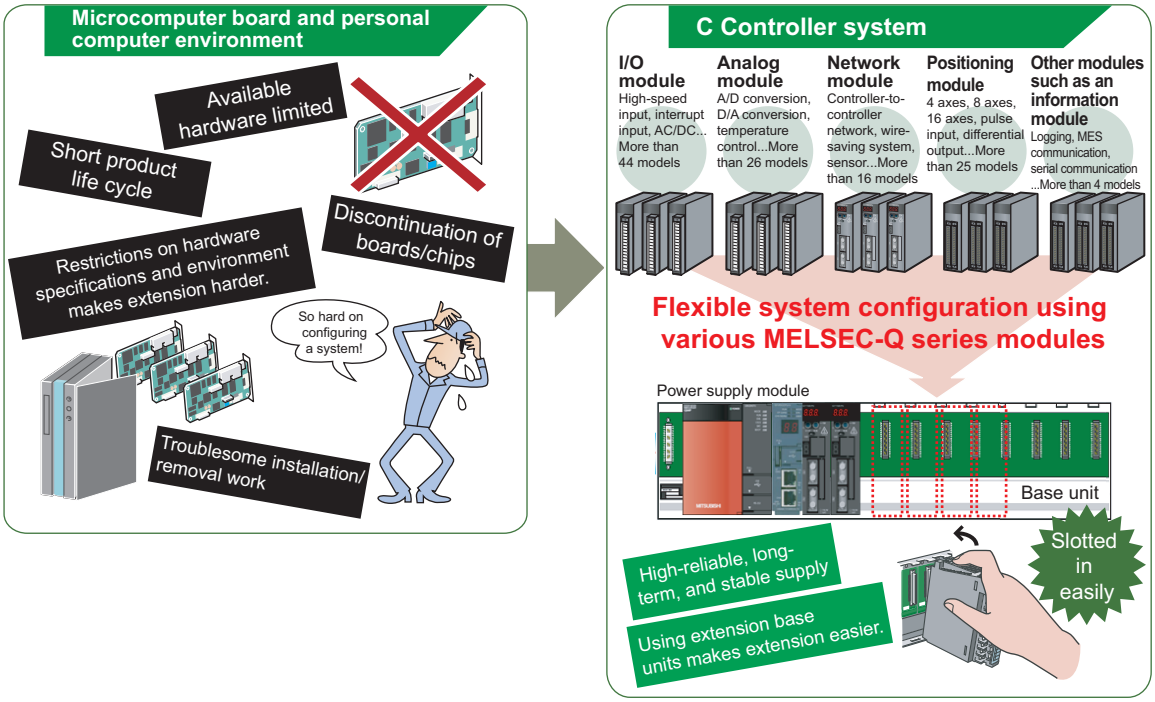
VxWorks also equips various functions, such as file access, drivers for the network functions, I/O and communication libraries, and therefore can be used for various purposes.

*1 A system that equally assigns execution time to multiple programs so that the processor (CPU) may not be dedicated to one program

■ Features

1. Flexible system configuration using various MELSEC-Q series modules

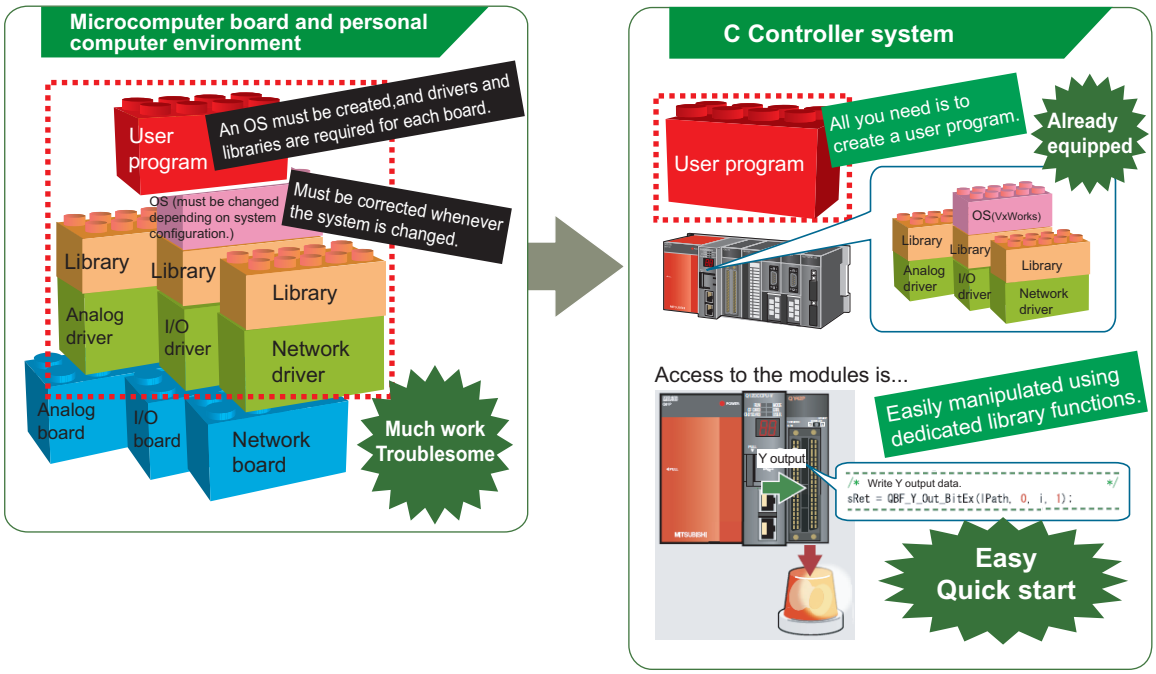
In a C Controller system, program resources can be reused and various MELSEC-Q series modules are available, making system configuration easier.



2. Equipped OS, drivers, and libraries allow you to focus on developing user programs

Since OS and communication drivers have been equipped with a C Controller module, you are no longer bothered with troublesome work under microcomputer board and personal computer environment (OS porting, driver development, OS writing to ROM) and can focus on developing a user program.

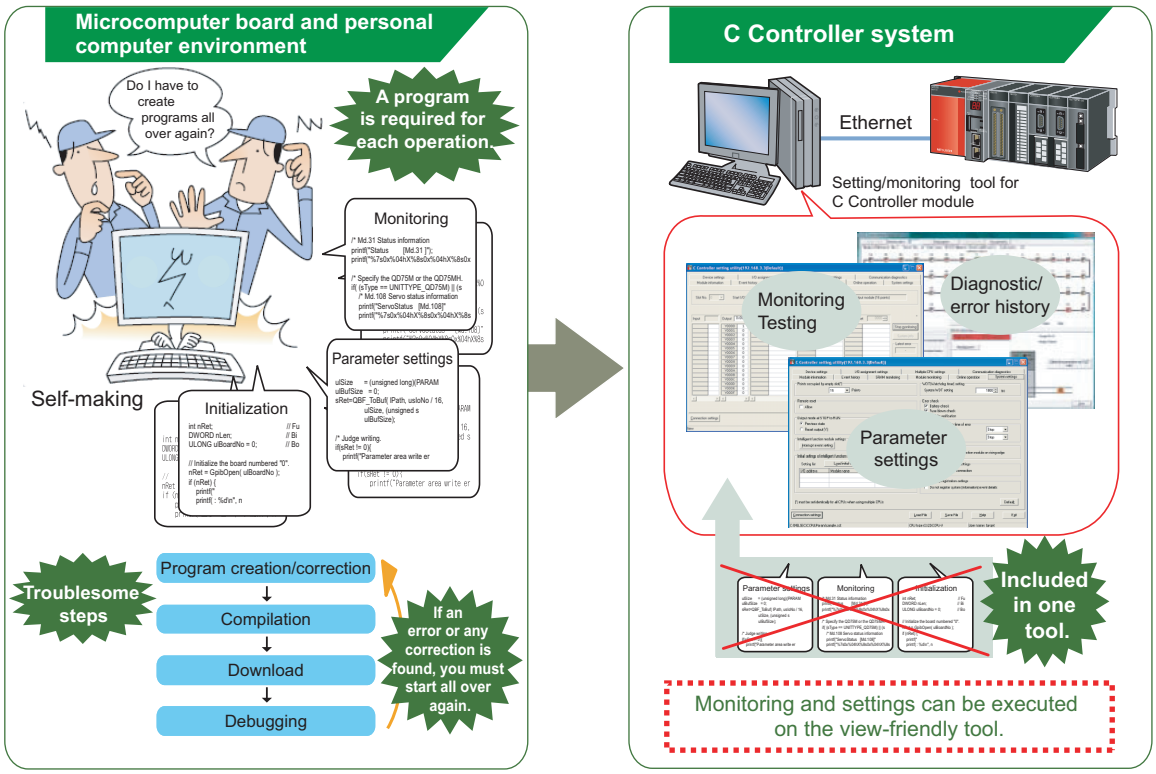
The C Controller module can easily access MELSEC-Q series modules using library functions dedicated for a C Controller module (bus interface function, MELSEC communication function).



3. Initialization, parameter settings, monitoring, and testing can be executed without a program

Complex programs for the initialization and the system settings of a C Controller module, and parameter settings of a network module are not required. The operations can be easily executed on view-friendly setting/monitoring tool for C Controller module.

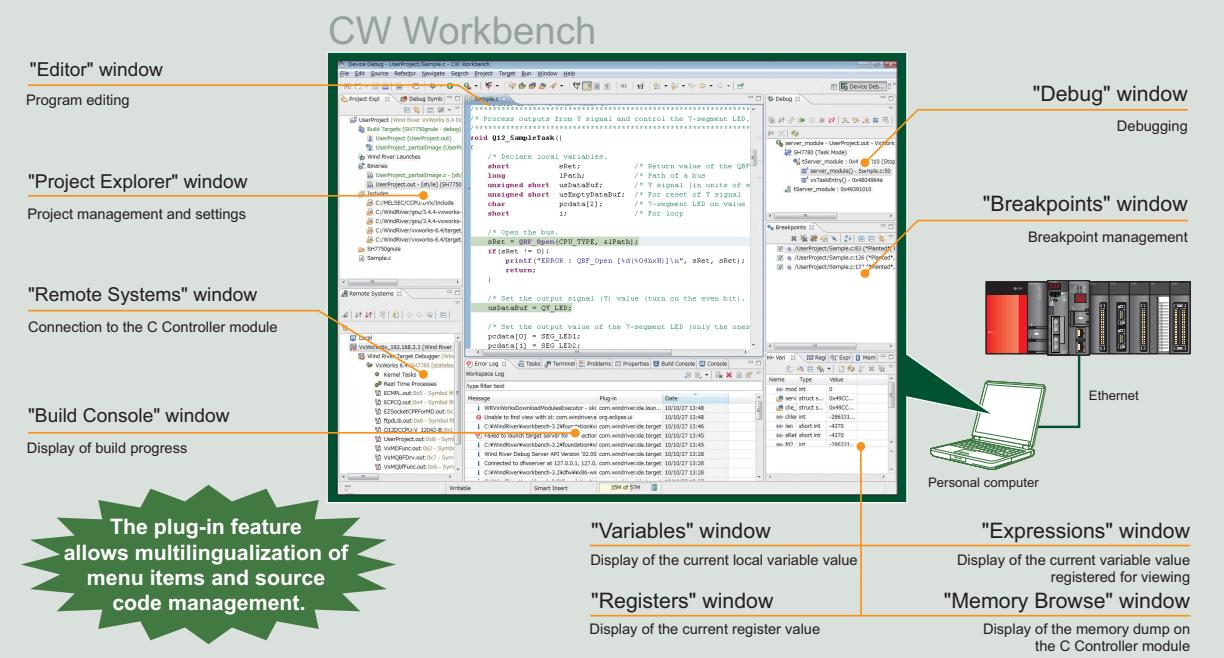
Programs to check module status, errors occurred in a C Controller module and in a user program, cable disconnection, and communication status are also not required.



4. Quick start using an integrated development environment, "CW Workbench"

An engineering tool for C Controller, "CW Workbench", equips basic functions such as program editing, generation of execution module, and debugging. A user program for a C Controller module is easily developed.

Eclipse-based CW Workbench allows function enhancement using a third-party plug-in software.

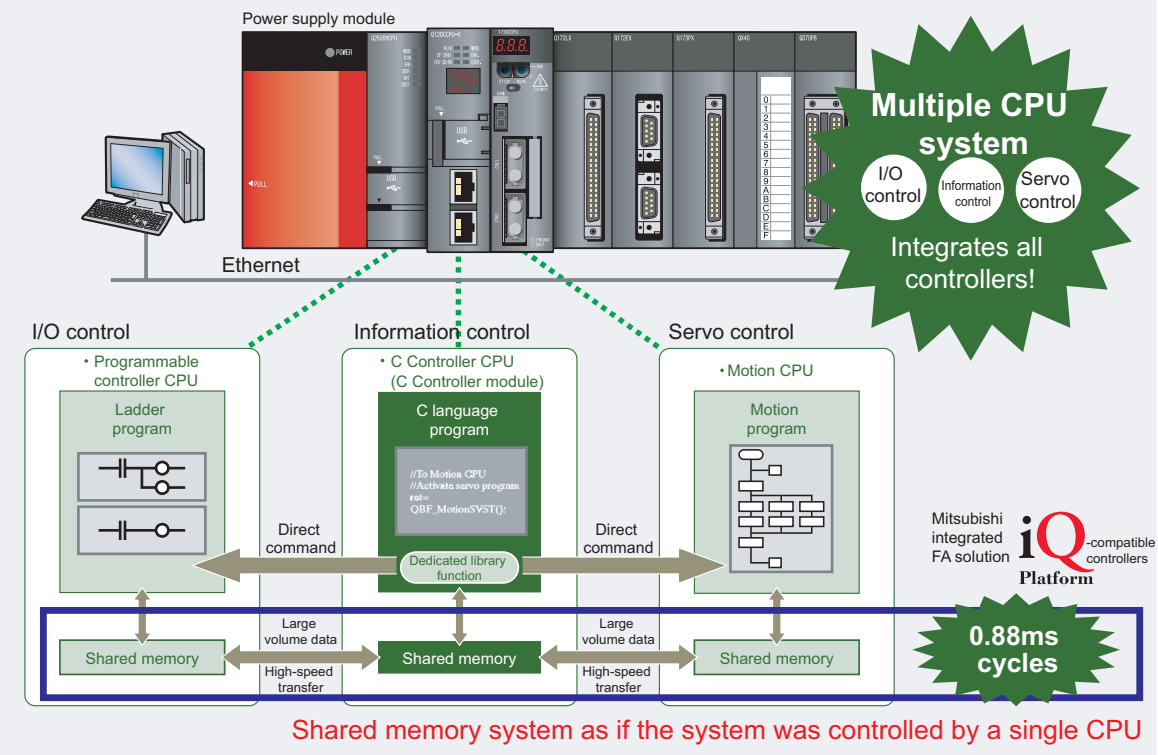


5. High-speed and high-precise control by multiple CPU high speed bus transmission

Multiple CPU high speed bus transmission supports real-time sequential control synchronized with the operation cycle of the Motion CPU (0.88ms) and tracking control to keep up with the constant changes in the target value.

Additionally, large volume data up to 14K words can be transferred at high speed (0.88ms cycles) without a program, and data can be shared among CPUs.

By integrating the C Controller module with the CPU that serves as the nerve center of the factory, the entire system can be efficiently controlled and the load of computational processing can be distributed.



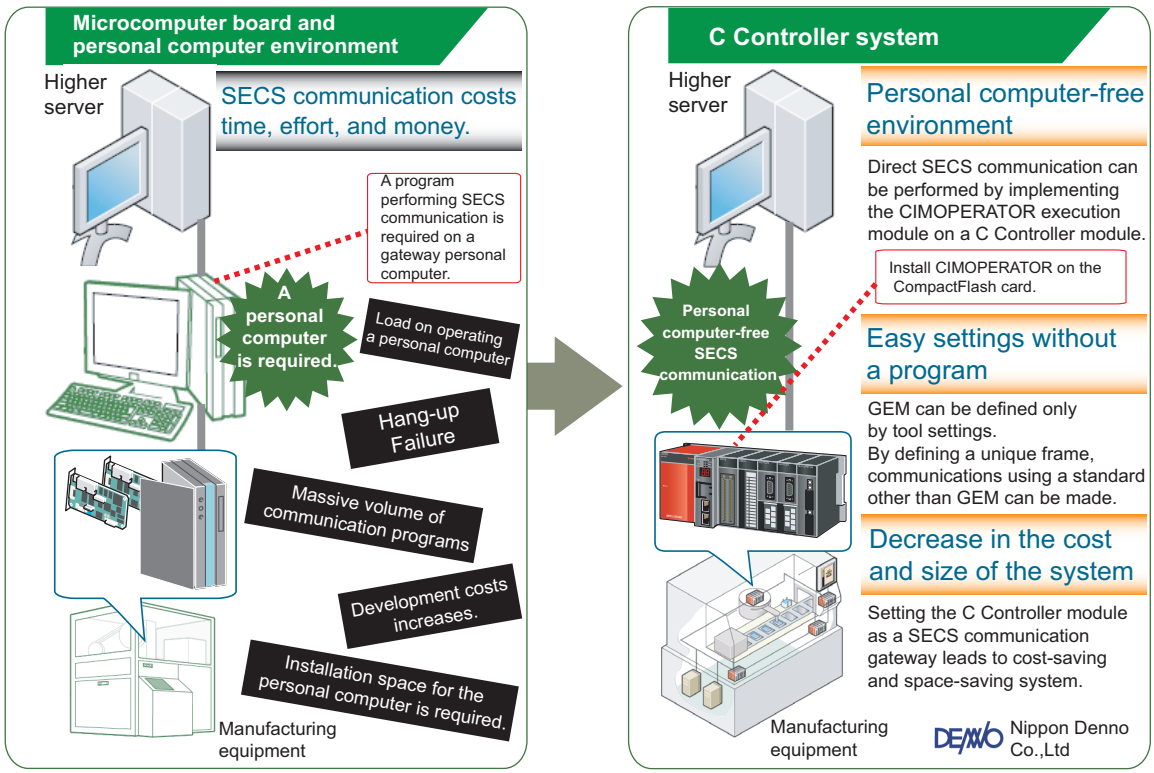
6. Wide application using partner products

In combination with the following partner products, higher functionality and easy information link can be achieved.

(1) Information link with SECS communication software package (CIMOPERATOR SECS+)

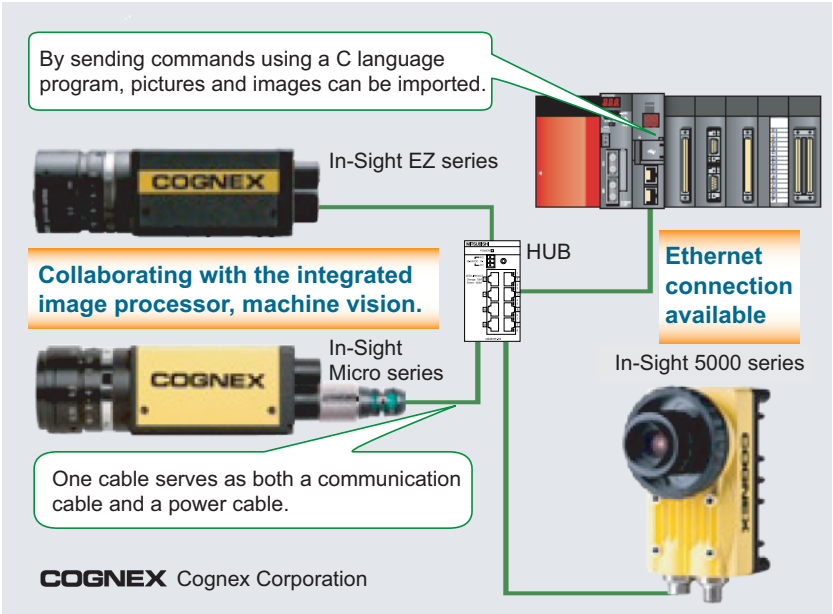
Introduction of CIMOPERATOR achieves personal computer-free and program-free SECS communication (GEM*1/non-GEM) with the higher server, enabling status management and information collection of manufacturing equipment.

*1 One of the industry-standard communication protocol used in semiconductor manufacturing lines



(2) Collaboration with the vision system (COGNEX In-Sight EZ, In-Sight Micro, and In-Sight5000 series)

Collaboration of the COGNEX machine vision with the C Controller module can easily automate manufacturing processes including measurement, inspection, and distinction of products.



RELATED MANUALS

This guide explains the basic operations of a C Controller module.
To make maximum use of the C Controller module, refer to the following.

■ Learning about a C Controller module

● C Controller Module User's Manual (Hardware Design, Function Explanation)
..... SH-080766ENG

This manual explains the system configuration, specifications, functions, handling, wiring, and troubleshooting of a C Controller module.

● C Controller Module User's Manual (Utility Operation, Programming)
..... SH-080767ENG

This manual explains the installation and uninstallation of SW□PVC-CCPU, utility operations, and functions and programming using SW□PVC-CCPU.

■ Learning about CW Workbench

● CW Workbench Operating Manual SH-080982ENG

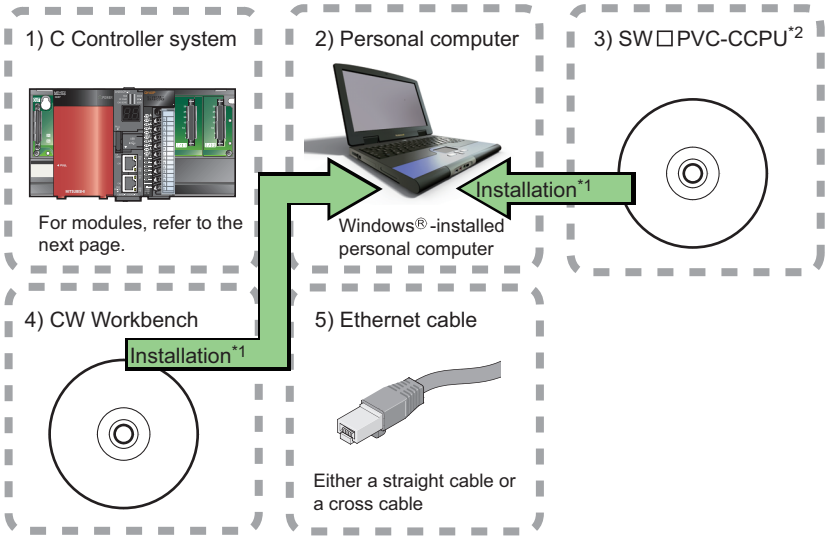
This manual explains the system configuration, installation and uninstallation, specifications, functions, and troubleshooting of CW Workbench.

USING C CONTROLLER MODULE

The C Controller module is installed with procedures as shown below.

<1> Preparing for Operation

Prepare the necessary devices.



*1 Install SW□PVC-CCPU and CW Workbench on the same personal computer beforehand.

Reference

For installation of SW□PVC-CCPU, refer to the following.

☞ C Controller Module User's Manual (Utility Operation, Programming): SH-080767ENG

For installation of CW Workbench, refer to the following.

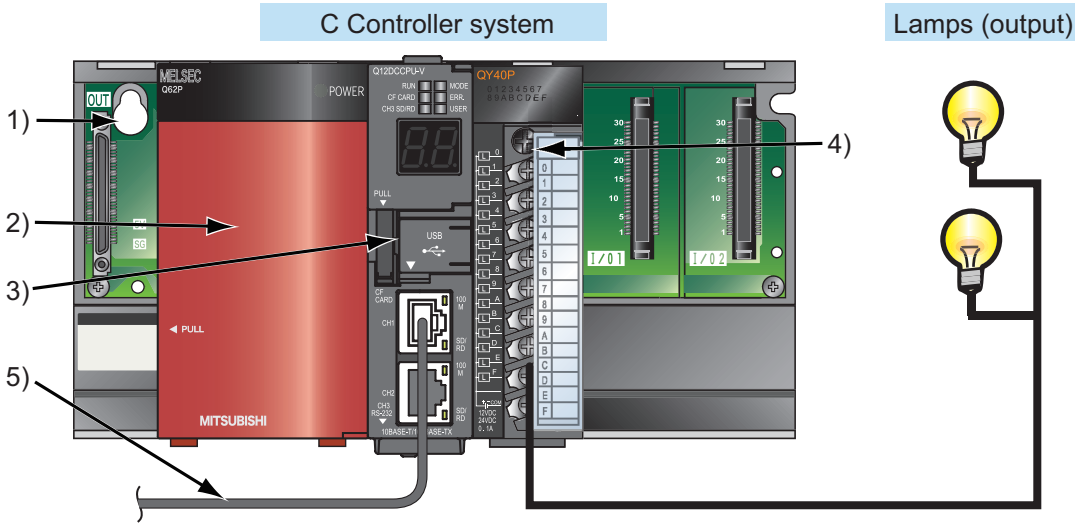
☞ CW Workbench Operating Manual: SH-080982ENG

*2 SW□PVC-CCPU is a setting/monitoring tool for C Controller module.

<2> System Configuration

1) System configuration example

This guide uses the following system configuration as an example.



*A wire to the power supply module is omitted.

No.	Name	Model	Description
1)	Base unit	Q33B	A unit on which a power supply module, a C Controller module, and I/O modules are mounted
2)	Power supply module	Q62P	Supplies power to modules such as a C Controller module and I/O modules.
3)	C Controller module	Q12DCCPU-V	Supervises the control process of a C Controller system.
4)	Output module	QY40P	-
5)	Cable (Ethernet cable)	An Ethernet cable meeting 10BASE-T/100BASE-TX standards	Connects the personal computer with SW□PVC-CCPU and CW Workbench installed to the C Controller module.

2) Mounting the modules

Mount the prepared modules on a base unit.

When using the C Controller module for the first time, connect a battery connector.

Caution

- Mount a battery before operation.
- Power off the system before mounting a module.

Point

- Mounting a battery to the C Controller module

1) Open the cover at the bottom of the C Controller module.

↓

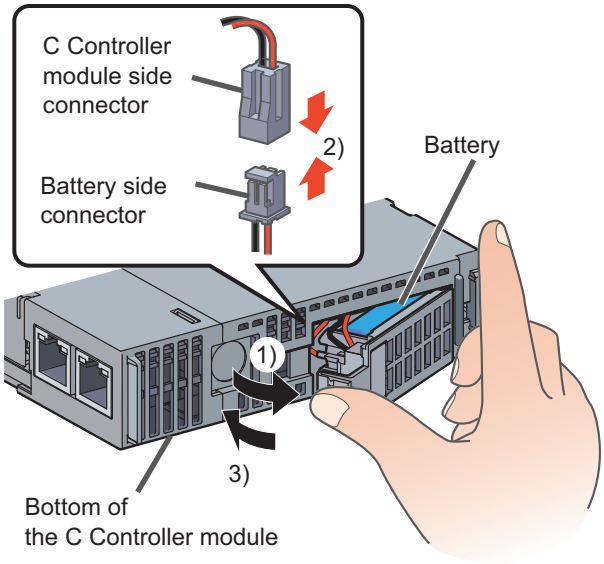
2) Insert the battery side connector into the C Controller module side connector in correct orientation.

↓

3) Close the cover at the bottom of the C Controller module.

↓

End



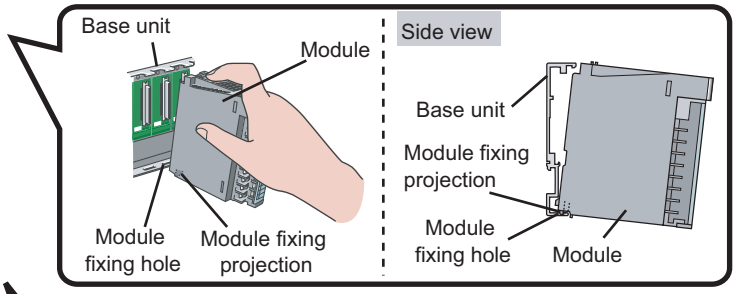
1) Insert the module fixing projection into the module fixing hole on the base unit.

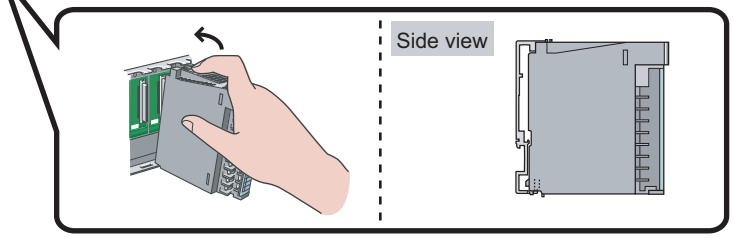
↓

2) Fully insert the module fixing projection in the arrow direction and press the module until the projection snaps into place.

↓

End





Reference

For how to remove a module, refer to the following.

☞ QCPU User's Manual (Hardware Design, Maintenance and Inspection): SH-080483ENG

3) Wiring the modules

Wire the power supply module.

Caution

Power off the system before wiring the module.

Reference

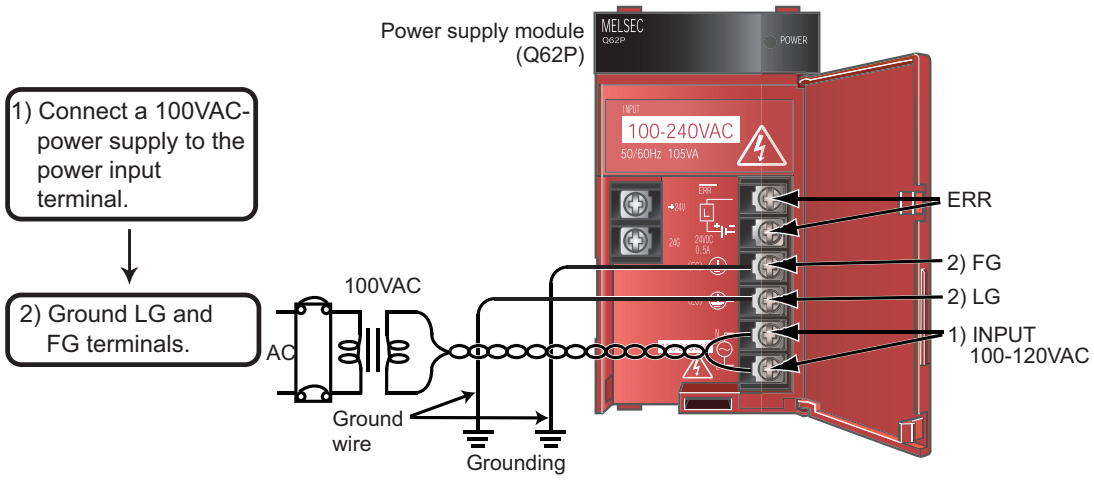
For wiring precautions, refer to the following.

☞ QCPU User's Manual (Hardware Design, Maintenance and Inspection): SH-080483ENG

1. Wiring the power supply module

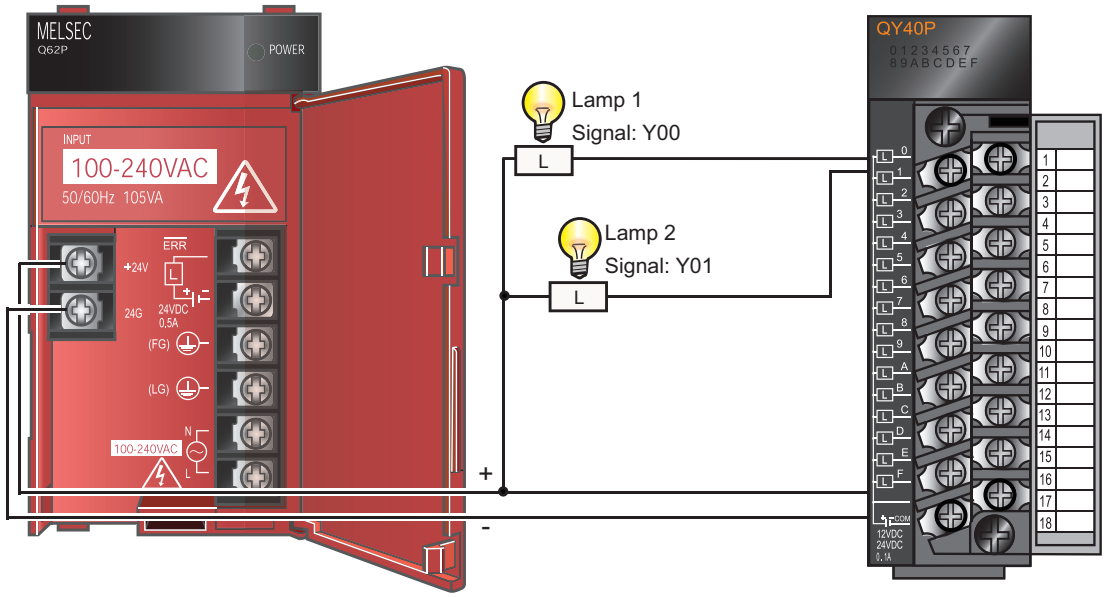
The following shows an example of wiring the power wire and the ground wire to the base unit.

Provide grounding to prevent electric shock and malfunction.



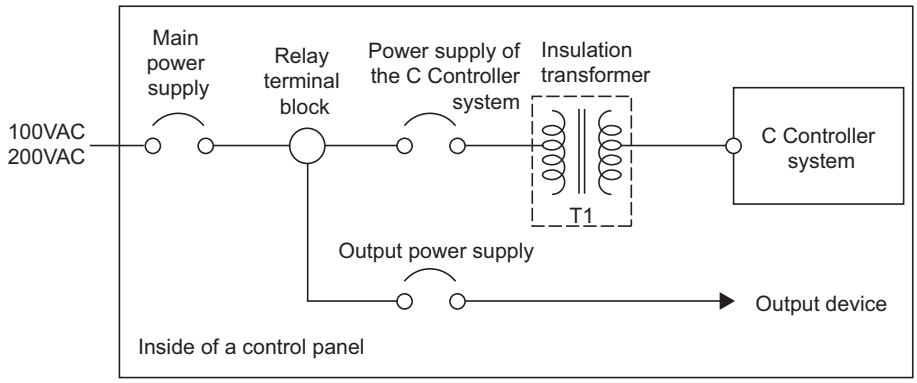
2. Wiring the output module

The following shows an example of wiring the output module (QY40P).



Point

Wire the power supply line of the output device and that of the C Controller system separately as shown below.



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〈2〉

4) Checking the power supply module

Check that the power supply module runs normally after installing the system, mounting the modules, and wiring the system.

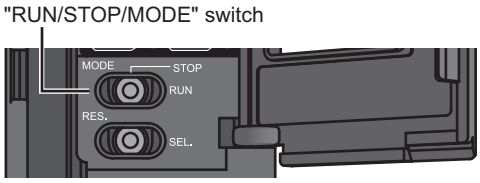
Operating procedure

1. Check the following before powering on the system.

- Wiring to the power supply module
- Power supply voltage

2. Set the C Controller module to STOP.

Open the cover on the front of the C Controller module and set the "RUN/STOP/MODE" switch to "STOP".



3. Power on the power supply module.

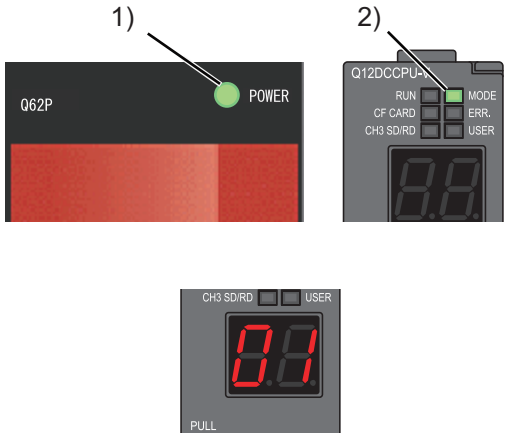
4. Check that the power supply module runs normally.

Check the front LED on each module.
The following lists the normal status of the LEDs.

1) Power supply module: The "POWER" LED lights in green.
2) C Controller module: The "MODE" LED lights in green.

When the C Controller module is the default (the standard RAM has not been initialized), the 7-segment LED displays a flashing "01". However, this does not mean a problem in this step.
The LED turns off after the module is initialized.

☞ "<3> Setting the Module" (P.21)



Construction of the system is ended.

Point

If the "POWER" LED of the power supply module remains off even after power-on, check that the power supply module is correctly wired and mounted.

Reference

If the "ERR." LED turns on or starts flashing, troubleshoot with reference to the following.

☞ C Controller Module User's Manual (Hardware Design, Function Explanation)
: SH-080766ENG

<3> Setting the Module

Configure settings to operate the C Controller module.

1) Initializing the C Controller module

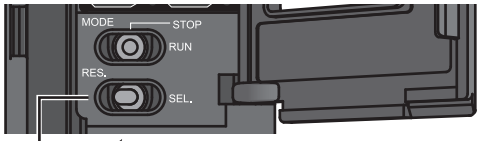
Prepare a standard RAM for the C Controller module.

⚠Caution

All files in the standard RAM are erased by module initialization.

Operating procedure

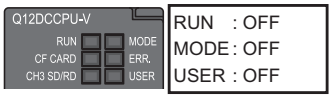
1) Open the cover on the module front and set the "RESET/SELECT" switch to "RESET".



Set the switch to "RESET".

"RESET/SELECT" switch

2) Check that the "MODE" LED is off.

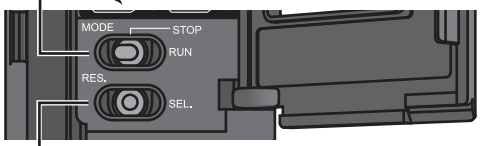


RUN : OFF
MODE : OFF
USER : OFF

3) Holding the "RUN/STOP/MODE" switch on the "MODE" position, set the "RESET/SELECT" switch to the center.

"RUN/STOP/MODE" switch

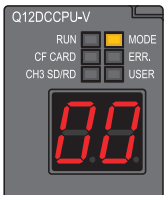
Hold the switch on the "MODE" position.



Return the switch to the center.

"RESET/SELECT" switch

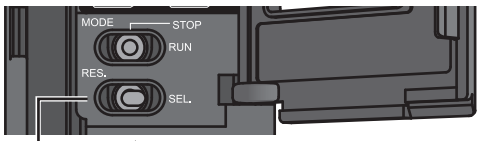
4) Check that the "MODE" LED lights in "orange", and the 7-segment LED displays "00".



RUN : OFF
MODE : Lights in orange.
USER : OFF

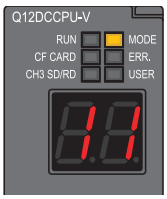
5) Release the "RUN/STOP/MODE" switch.
The switch returns to the "STOP" position.

6) Repeatedly set the "RESET/SELECT" switch to "SELECT" until the 7-segment LED displays "11" ("module initialization setting" mode).



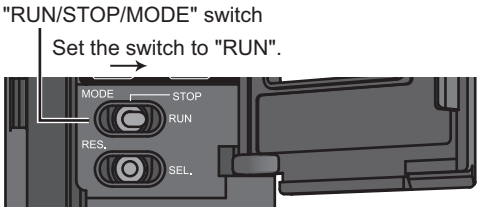
Repeatedly set the switch to "SELECT".

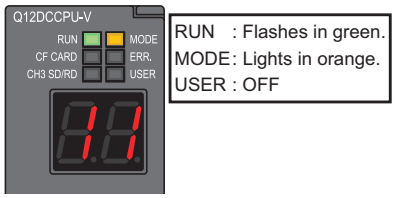
"RESET/SELECT" switch



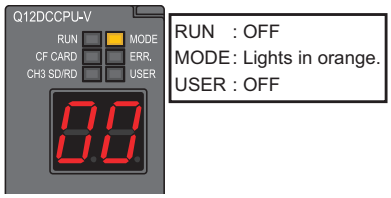
RUN : OFF
MODE : Lights in orange.
USER : OFF

7) Set the "RUN/STOP/MODE" switch to "RUN" and initialize the module. The "RUN" LED will be flashing during initialization.





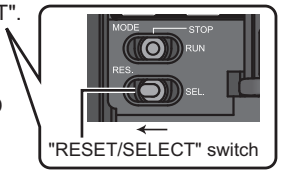
8) Check that the "RUN" LED turns off, and the 7-segment LED displays "00". Reset the C Controller module.



Point

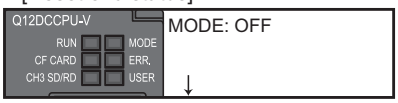
Resetting procedure

1) Set the "RESET/SELECT" switch on the front of the C Controller module to "RESET".

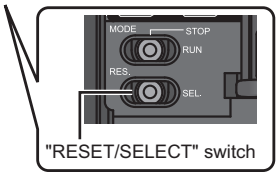


2) Check that the "MODE" LED turns off.

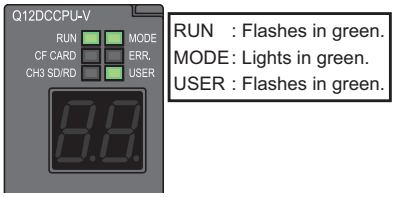
[Reset end status]



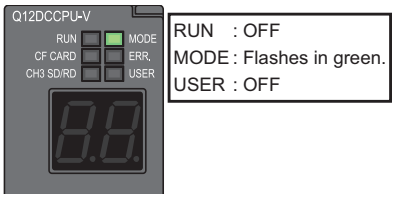
3) Set the "RESET/SELECT" switch to the center.



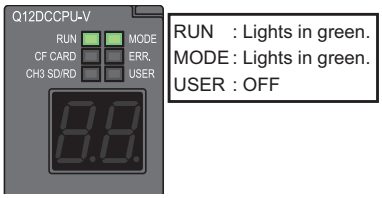
9) Resetting the C Controller module will format the standard RAM.
The "RUN" LED and the "USER" LED start flashing in green.



10) When the formatting is ended, the "RUN" LED and the "USER" LED end flashing, and the "MODE" LED starts flashing in green.



11) Reset the C Controller module.
When the formatting is completed, the "RUN" LED and the "MODE" LED light in green.



Caution

Do not operate the switches using a sharp-pointed tool such as a driver.
Doing so may damage the switches.

2) Setting parameters

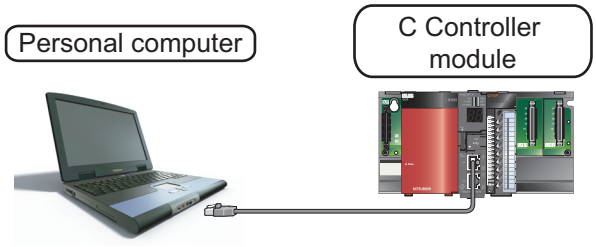
Set parameters for the C Controller module.

Terminology

Parameter: Setting data required for a C Controller system to operate.
Set modules and a network in a C Controller system using C Controller setting utility.

1. Connecting a C Controller module to a personal computer

Connect CH1 of the C Controller module to a personal computer using an Ethernet cable.



Caution

The IP address of the C Controller module and that of the personal computer must be set to the same segment.
Since this guide uses the default IP address for the C Controller module (192.168.3.3), set the IP address for the personal computer to "192.168.3.* (*: other than 0, 3, and 255)".
Set the subnet mask for the personal computer to "255.255.255.0".

Reference

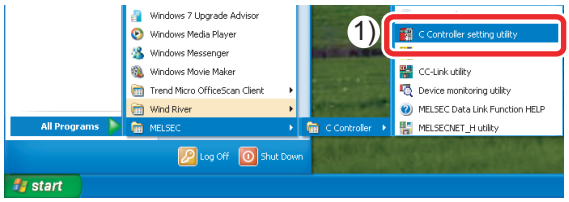
For how to change an IP address, refer to the following.

☞ C Controller Module User's Manual (Hardware Design, Function Explanation)
: SH-080766ENG

2. Starting C Controller setting utility

Operating procedure

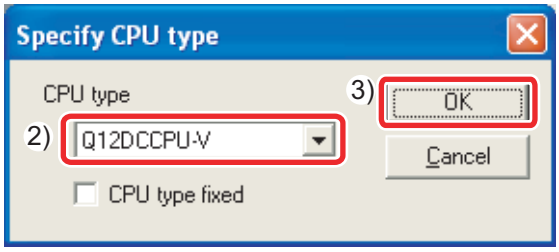
1) Select [start]→[All Programs]→[MELSEC]→[C Controller]→[C Controller setting utility].



The "Specify CPU type" window appears.

2) Select "Q12DCCPU-V".

3) Click the OK button.



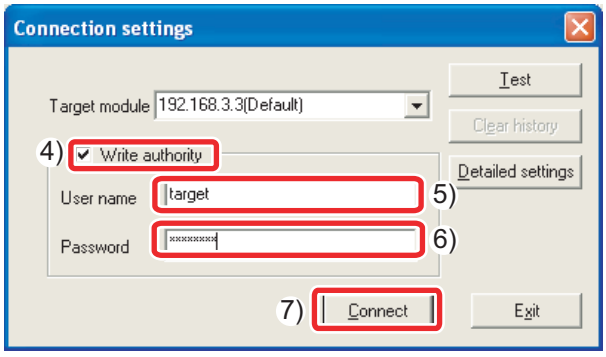
The "Connection settings" window appears.

4) Select the "Write authority" check box.

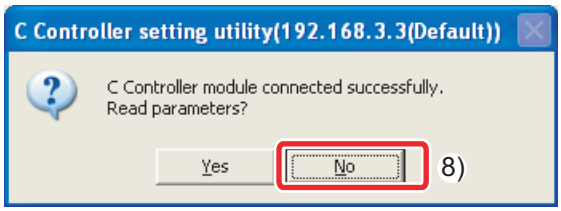
5) Enter "target".

6) Enter "password".

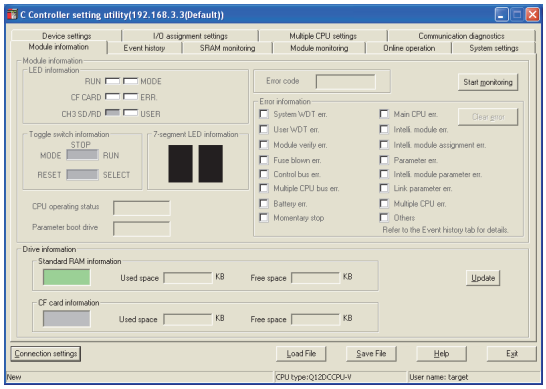
7) Click the Connect button.



8) Click the No button.



The "C Controller setting utility" window appears.



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〈3〉

3. Writing the parameters to the C Controller module

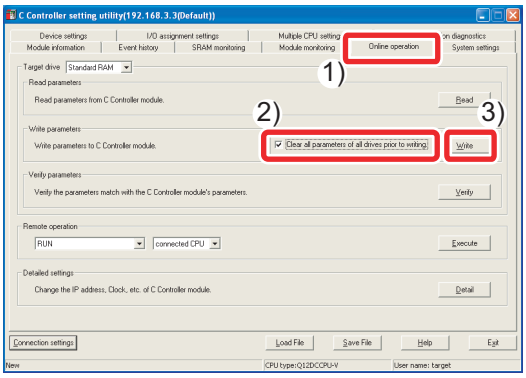
Write the parameters to the C Controller module using C Controller setting utility.

Operating procedure

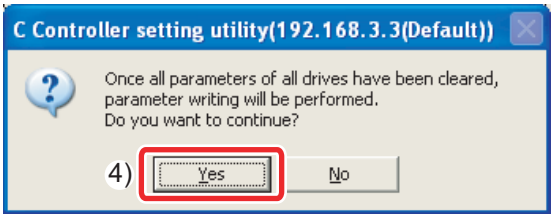
1) Select the "Online operation" tab in C Controller setting utility.

2) Select the "Clear all parameters of all drives prior to writing." check box.

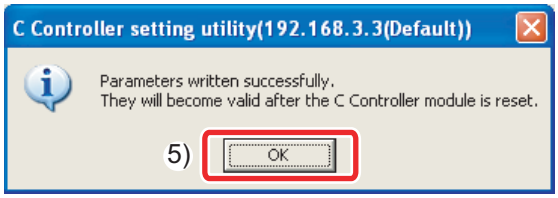
3) Click the Write button.



4) Click the Yes button.

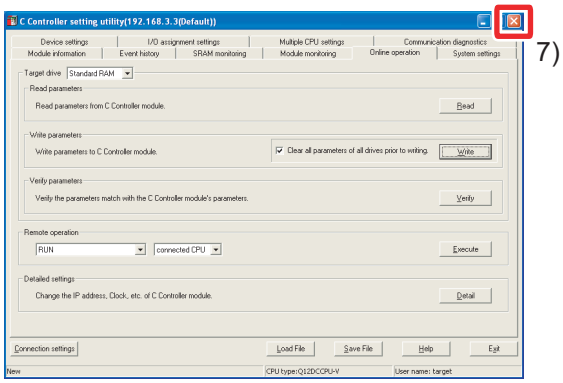


5) When the writing is completed, the following window appears.
Click the OK button.

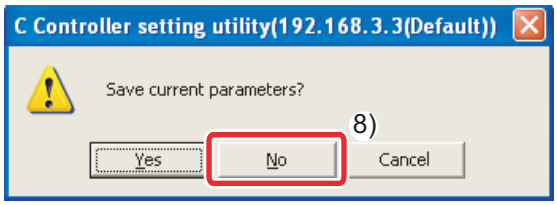


6) Reset the C Controller module.
After resetting the C Controller module, the written parameters will be valid.

7) Click the button to exit C Controller setting utility.



8) The following window appears.
Click the No button.



<4> Knowledge Required for Programming

1. Bus interface functions

The bus interface function is a library function dedicated for a C Controller module.
Using this function in a user program allows a C Controller module to easily control MELSEC-Q series modules.

(1) Opening/closing a bus

To use the functions, open a bus at the start of the program and close the bus at the end of the program.

Functions to open/close a bus

Name	Function
QBF_Open	Opens a bus.
QBF_Close	Closes a bus.

Point

Open or close a bus (QBF_Open/QBF_Close functions) once at the start of a program and at the end of a program, respectively.
By using these functions only once, communication performance will be improved.

(2) I/O access

1-point access and 1-word access are available.

1) 1-point access: A function that treats 1-point data (ON/OFF of switches and lamps)

Example of 1-point access functions

Name	Function
QBF_X_In_BitEx	Reads an input signal (X) in units of one point.
QBF_Y_Out_BitEx	Outputs an output signal (Y) in units of one point.
QBF_Y_In_Bit_Ex	Reads an output signal (Y) in units of one point.

2) 1-word access: A function that treats 1-word (16 bits) data (numeric values, characters)

Example of 1-word access functions

Name	Function
QBF_X_In_WordEx	Reads an input signal (X) in units of words.
QBF_Y_Out_WordEx	Outputs an output signal (Y) in units of words.
QBF_Y_In_WordEx	Reads an output signal (Y) in units of words.

(3) User LED control

USER LED control and 7-segment LED control are available.

Example of user LED control functions

Name	Function
QBF_ControlLED	Controls the "USER" LED of a C Controller module.
QBF_Control7SegLED	Controls the 7-segment LED of a C Controller module.

Reference

Only the basic bus interface functions are explained in this section.
Bus interface function for controlling modules and the MELSEC communication function are also available.

☞ Bus interface function help window and MELSEC communication function help window in SW□PVC-CCPU

☞ C Controller Module User's Manual (Utility Operation, Programming): SH-080767ENG

2. Bus interface functions used in this guide

Basic bus interface functions, output access and 7-segment LED control, are used in the program created in this guide.

• Opening/closing a bus: QBF_Open/QBF_Close functions

Format

ret = QBF_Open(unit, path);

Type	Name	Description	IN/OUT
short	ret	Return value	OUT
short	unit	Module identification (fixed to 2)	IN
long	*path	Pointer to the path of the opened module	OUT

Format

ret = QBF_Close (path);

Type	Name	Description	IN/OUT
short	ret	Return value	OUT
long	path	Path of the opened bus	IN

• Output access: QBF_Y_Out_WordEx function

Format

ret = QBF_Y_Out_WordEx(path, sFlg, usYno, usSize, pusDataBuf, usBufSize);

Type	Name	Description	IN/OUT
short	ret	Return value	OUT
long	path	Path of the opened bus	IN
short	sFlg	Access flag (0: Normal access, 1: High-speed access, Others: Reserved (normal access))	IN
unsigned short	usYno	Start output number (Y)	IN
unsigned short	usSize	Write size in words	IN
unsigned short	*pusDataBuf	Write data	IN
unsigned short	usBufSize	Dummy (fixed to 0)	IN

• 7-segment LED control: QBF_Control7SegLED function

Format

ret = QBF_Control7SegLED(path, mode, data);

Type	Name	Description	IN/OUT
short	ret;	Return value	OUT
long	path;	Opened bus path	IN
long	mode;	Mode (0: Manual mode, 1: Auto mode, Other: Same as 0)	IN
char	*data;	LED data	IN

Description

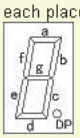
- Displays the values specified in LED data on the 7-segment LED, in accordance with the method specified in mode.

[When Mode 0: Manual mode]

Displays the specified data in the format below, where:
data[0] 7-segment LED: data of ones place, and
data[1] 7-segment LED: data of tens place.

Data format of each place:

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Segment	DP	g	f	e	d	c	b	a



*Segment: Refer to the drawing on the left.
*Bit value
0: LED OFF (off)
1: LED ON (on)

Reference

The following data types are available for C language and C++ language programming used on a C Controller module.

Data type	Bit width	Designation
byte	8	Unsigned integer
char	8	Character string
unsigned char	8	Unsigned character string
short	16	Signed short integer
unsigned short	16	Unsigned short integer
int	32	Signed (long) integer
long	32	
unsigned long	32	Unsigned (long) integer
float	32	Single-precision real number
double	64	Double-precision real number
void	-	-

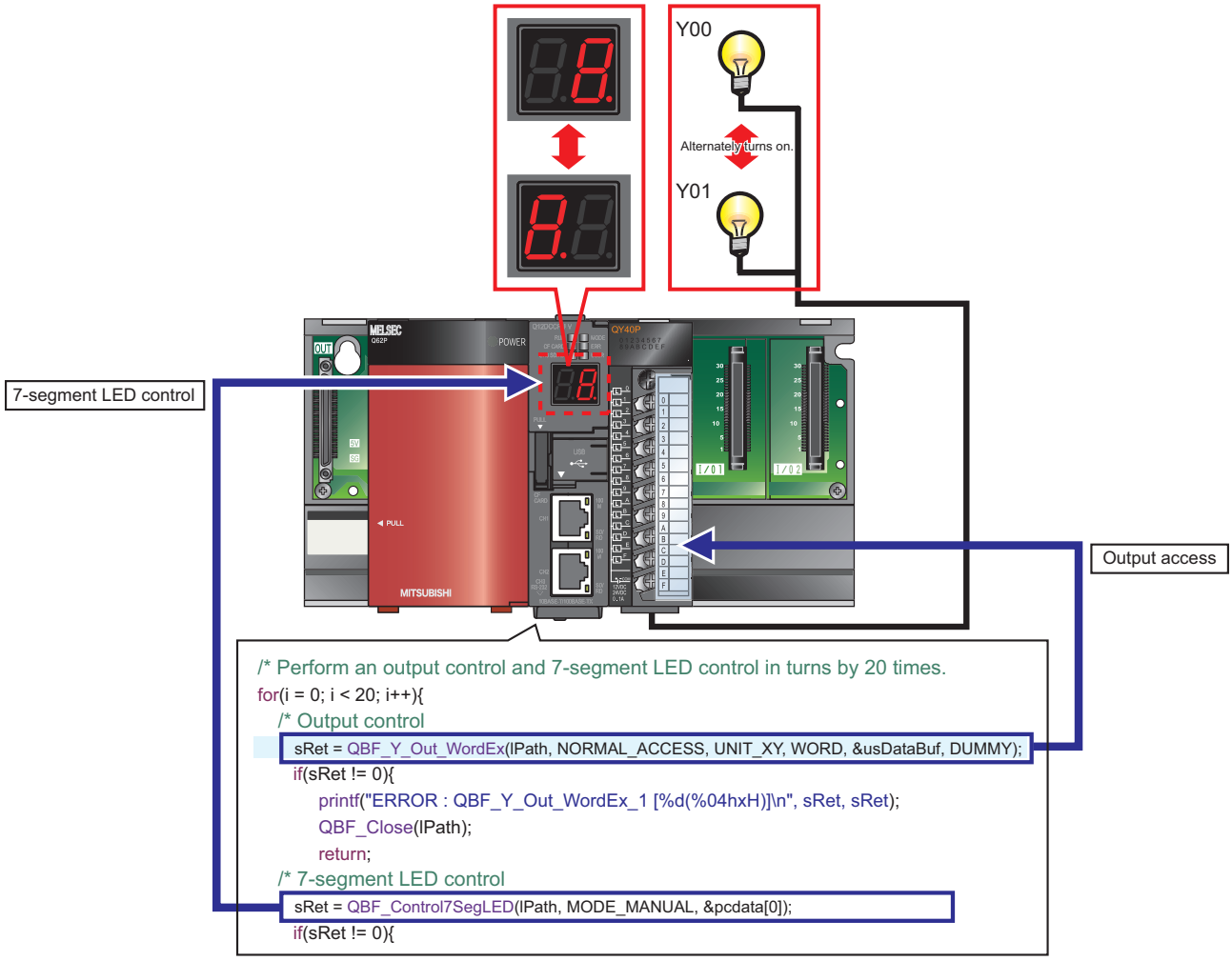
<5> Programming

Create a program in which lamps connected to an output module and the 7-segment LED on the front of the C Controller module flash.

1. Program example and control description

Create a program that performs the following control.

When the C Controller module is set to RUN, output lamps Y00 and Y01 alternately turn on. Synchronizing with the on status of the output lamps, the tens place and ones place of the 7-segment LED alternately turn on.



2. Source code

The following describes source codes.

```
/*****************************************************************************************************************/
/* Function header                                                                                               */
/*****************************************************************************************************************/
#include <vxworks.h>            /* VxWorks function header                                                       */
#include <taskLib.h>            /* VxWorks function header                                                       */
#include <stdio.h>              /* Standard function header                                                      */
#include "QbfFunc.h"            /* Bus interface function header                                                 */
```

Declare the file that defined a function list for use of the library function.

```
/*****************************************************************************************************************/
/* Definition                                                                                                    */
/*****************************************************************************************************************/
/* For debugging                                                                                                 */
#define UNIT_XY                 0x0000      /* Start I/O number of the module                                    */
#define QY_LED                  0x5555      /* Initial output value of Y signal (even bit: on)                   */
#define SEG_LED1                0xFF        /* Initial output value of 7-segment LED (ones place)                */
#define SEG_LED2                0x00        /* Initial output value of 7-segment LED (tens place)                */

/*****************************************************************************************************************/
/* For QBF function                                                                                              */
#define CPU_TYPE                2           /* CPU identification flag (CCPU: 2)                                 */
#define WORD                    1           /* 1-word specification                                              */
#define NORMAL_ACCESS           0           /* General access specification                                      */
#define DUMMY                   0           /* Dummy                                                             */
#define MODE_MANUAL             0           /* 7-segment LED control mode                                        */
```

Define values used for the control.

```
/*****************************************************************************************************************/
/* Process outputs from Y signal and control the 7-segment LED.                                                  */
/*****************************************************************************************************************/
void Q12_SampleTask()
{
    /* Declare local variables.                                                                                  */
    short           sRet;               /* Return value of the QBF function                                  */
    long            lPath;              /* Path of a bus                                                     */
    unsigned short  usDataBuf;          /* Y signal (in units of words)                                      */
    unsigned short  usEmptyDataBuf;     /* For reset of Y signal                                             */
    char            pcdata[2];          /* 7-segment LED on value                                            */
    short           i;                  /* For loop                                                          */

    /* Open the bus.                                                                                             */
    sRet = QBF_Open(CPU_TYPE, &lPath);
    if(sRet != 0){
        printf("ERROR : QBF_Open [%d(%04hxH)]\n", sRet, sRet);
        return;
    }

    /* Set the output signal (Y) value (turn on the even bit).                                                   */
    usDataBuf = QY_LED;

    /* Set the output value of the 7-segment LED (only the ones places are all lit).                             */
    pcdata[0] = SEG_LED1;
    pcdata[1] = SEG_LED2;

    /* Perform an output control and 7-segment LED control in turns by 20 times.                                 */
    for(i = 0; i < 20; i++){
        /* Output control                                                                                        */
        sRet = QBF_Y_Out_WordEx(lPath, NORMAL_ACCESS, UNIT_XY, WORD, &usDataBuf, DUMMY);
        if(sRet != 0){
            printf("ERROR : QBF_Y_Out_WordEx_1 [%d(%04hxH)]\n", sRet, sRet);
            QBF_Close(lPath);
            return;
        }

        /* 7-segment LED control                                                                                 */
        sRet = QBF_Control7SegLED(lPath, MODE_MANUAL, &pcdata[0]);
        if(sRet != 0){
            printf("ERROR : QBF_Control7SegLED_1 [%d(%04hxH)]\n", sRet, sRet);
            QBF_Close(lPath);
            return;
        }

        /* Invert the output signal (Y) value (turn on the bits in order of odd bit -> even bit ->...).         */
        usDataBuf = ~usDataBuf;
```

Enable the bus interface function at the start of the program.

Control the output module using the bus interface function.

Control the 7-segment LED using the bus interface function.

```
    /* Invert the output values of the 7-segment LED (turn on in order of all ones places -> all tens places...).  */
    pcdata[0] = ~pcdata[0];
    pcdata[1] = ~pcdata[1];

    /* Wait.                                                                                                      */
    taskDelay(40);
  }
  /* Reset the Y signal.                                                                                          */
  usEmptyDataBuf = 0x00;
  sRet = QBF_Y_Out_WordEx(lPath, NORMAL_ACCESS, UNIT_XY, WORD,
      &usEmptyDataBuf, DUMMY);
  if(sRet != 0){
    printf("ERROR : QBF_Y_Out_WordEx_2 [%d(%04hxH)]\n", sRet, sRet);
    QBF_Close(lPath);
    return;
  }

  /* Reset the 7-segment LED.                                                                                     */
  pcdata[0] = 0x00;
  pcdata[1] = 0x00;
  sRet = QBF_Control7SegLED(lPath, MODE_MANUAL, &pcdata[0]);
  if(sRet != 0){
    printf("ERROR : QBF_Control7SegLED_2 [%d(%04hxH)]\n", sRet, sRet);
    QBF_Close(lPath);
    return;
  }
  /* Close the bus.                                                                                               */
  QBF_Close(lPath);
  return;
}
```

Turn off both outputs from the output module and the 7-segment LED.

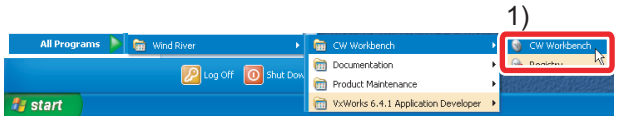
Disable the bus interface function at the end of the program.

1) Creating a project

1. Starting CW Workbench

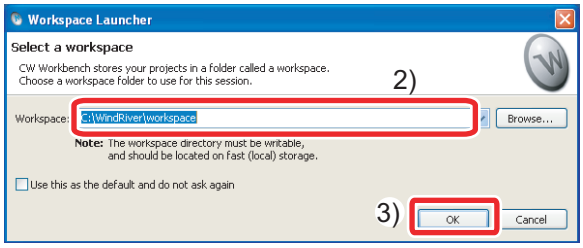
Operating procedure

1) Select [start]→[All Programs]→[Wind River]→[CW Workbench]→[CW Workbench].

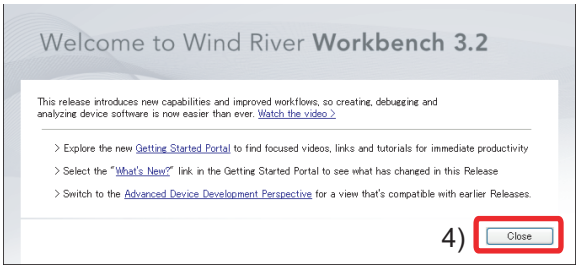


2) Enter the storage location of the workspace.
In this procedure, enter "C:\WindRiver\workspace".

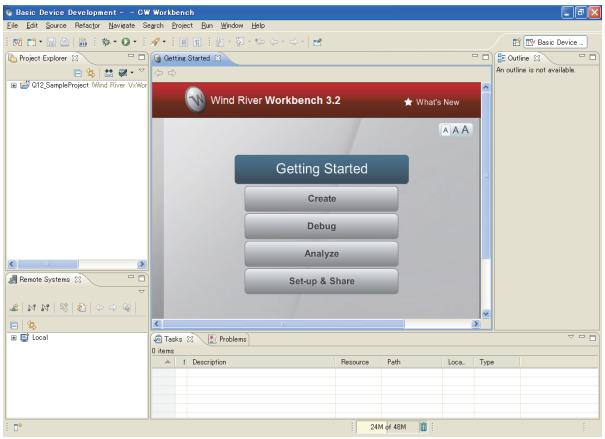
3) Click the OK button.



4) Click the Close button.



The main window of CW Workbench appears.



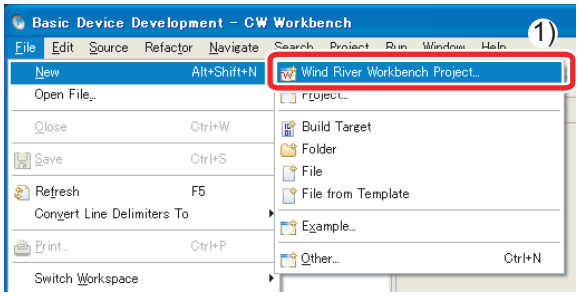
Reference

- The default window sizes and icon positions on CW Workbench depends on a personal computer. If a window size differs from that shown in this guide, adjust the size.
- To default an enlarged/deleted window, select [Window]→ [New Window].

2. Creating a project

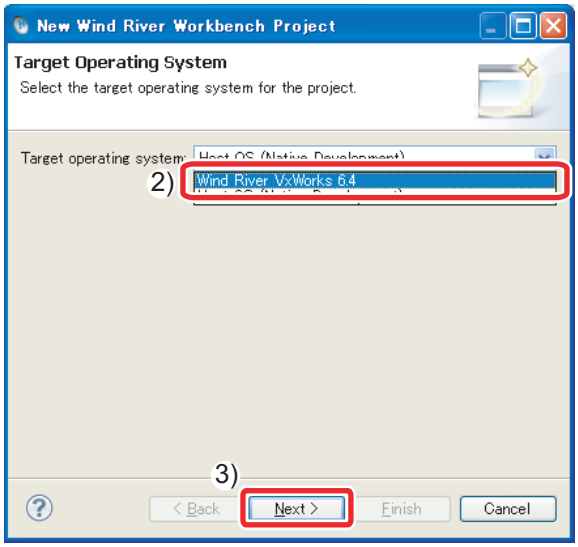
Operating procedure

1) Select [File]→[New]→[Wind River Workbench Project...].



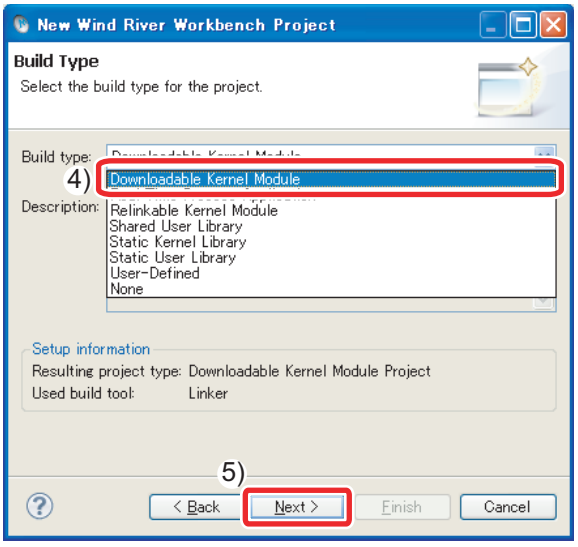
2) Select "Wind River VxWorks6.4".

3) Click the Next > button.



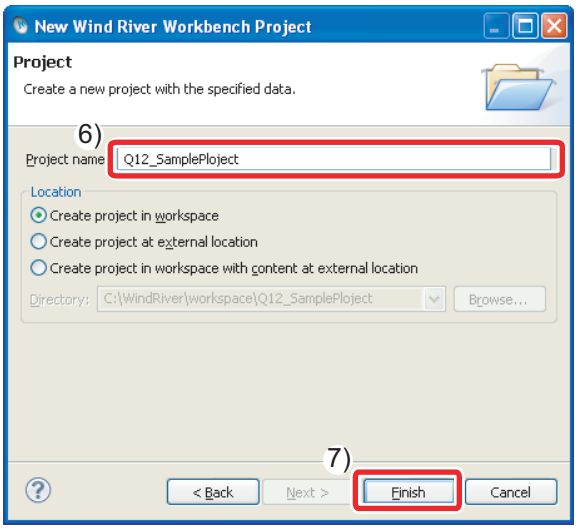
4) Select "Downloadable Kernel Module".

5) Click the Next > button.



6) Enter a project name.
In this procedure, enter "Q12_SampleProject".

7) Click the Finish button.



The project has been created.

3. Creating a project property

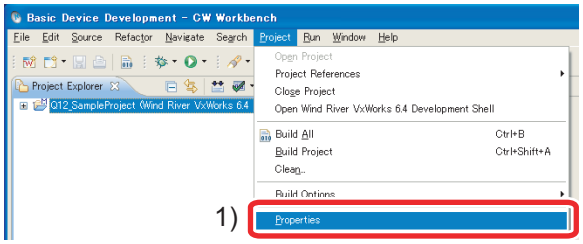
Configure settings to convert (build) the created project into a module that can be executed on a C Controller module.

Terminology

Build: An operation that compiles source codes according to a processor and links the code to the include file.

(1) Setting the processor

1) Select the created project in the "Project Explorer" window, and click [Project]→[Properties].

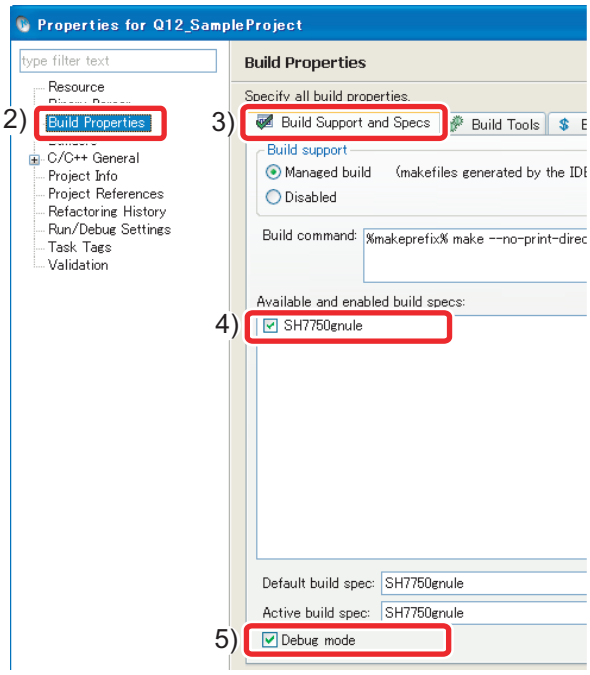


2) Select "Build Properties" from the tree view to the left in the window.

3) Click the "Build Support and Specs" tab.

4) Select the "SH7750gnule" check box only in "Available and enabled build specs:".

5) Select the "Debug mode" check box.



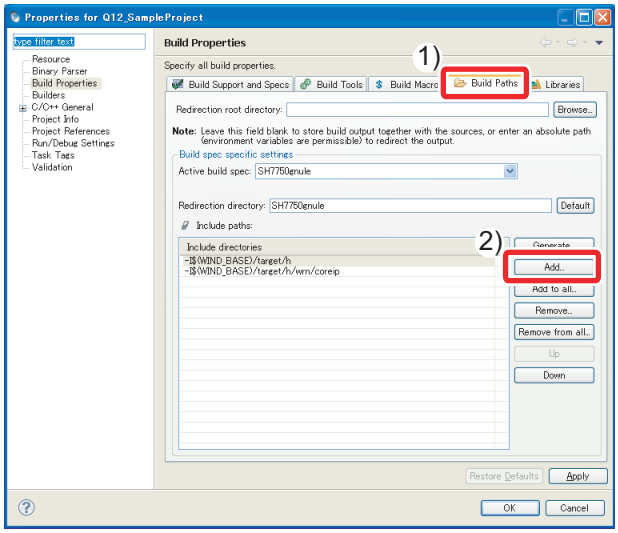
Point

Clear the "Debug mode" check box for the actual system operation.

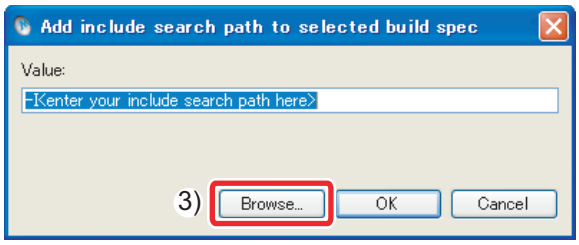
(2) Setting a include file

1) Click the "Build Paths" tab.

2) Click the Add... button.



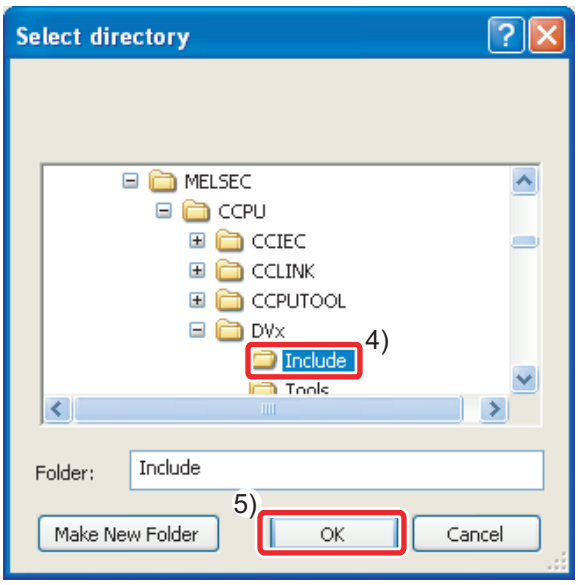
3) Click the Browse... button.



4) Select the include folder dedicated for the C Controller module in the "Select directory" window.

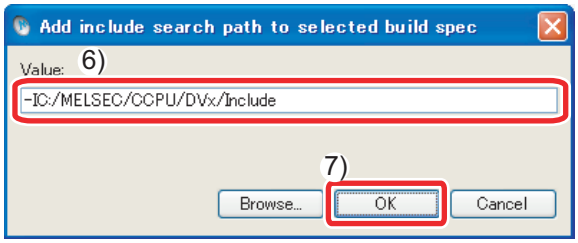
In this procedure, the folder is the one when SW□PVC-CCPU has been installed on "C:\MELSEC".

5) Click the OK button.



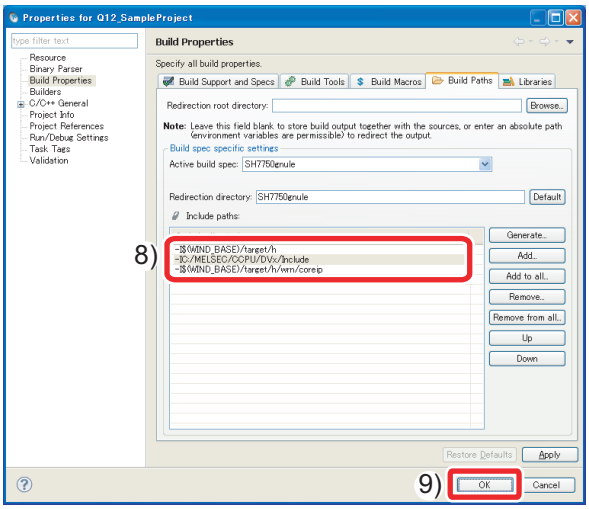
6) Check that the folder specified in the "Select directory" window has been selected.

7) Click the OK button.

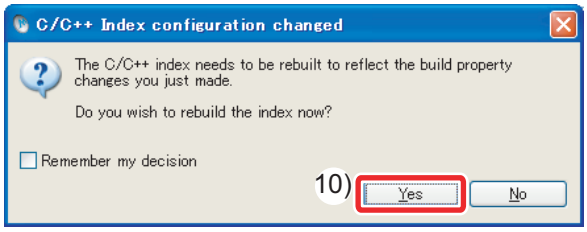


8) Check that the added include path is displayed in the "Include paths:" area.

9) Click the OK button.



10) If the following message appears after clicking the OK button, click the Yes button.



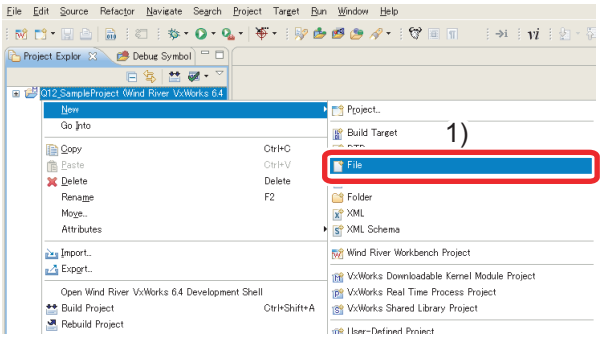
The project property has been set.

2) Creating a user program

Create a user program that controls a C Controller system.

Operating procedure

1) Right-click the created project in the "Project Explorer" window, and click [New]→[File].

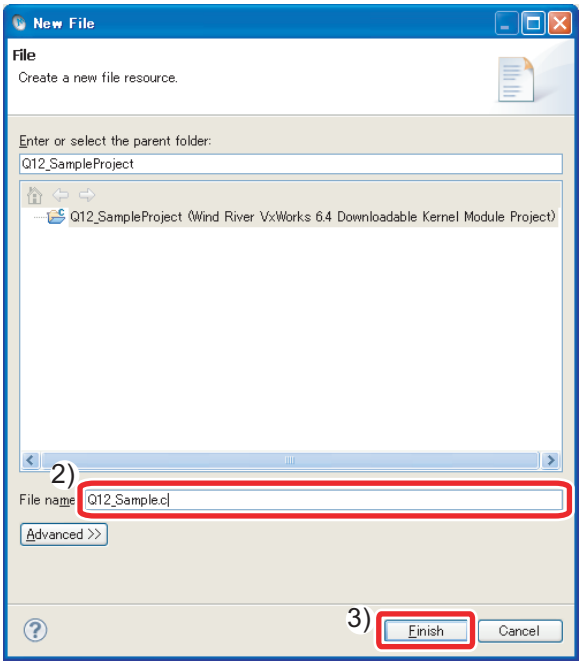


2) Enter a source file name to be created in "File name:".
Enter "Q12_Sample.c" in this procedure.

Point

Enter a file name with extension.
Do not use two-byte characters for a file name. If used, a compilation error occurs in compilation.

3) Click the Finish button.



4) Describe "Source code"(P.30) to access the output module and to control the 7-segment LED in the "Editor" window.

5

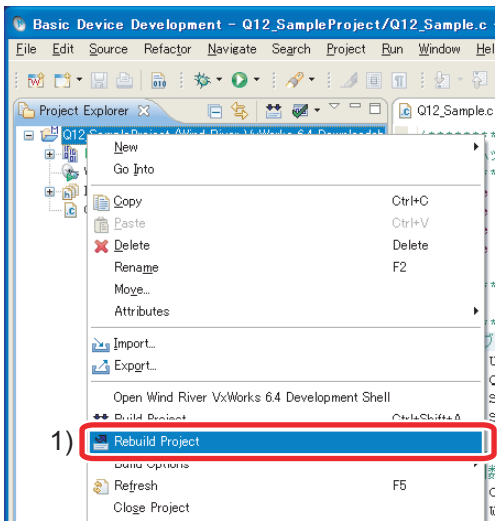
〈5〉

3) Generating an execution module from the user program

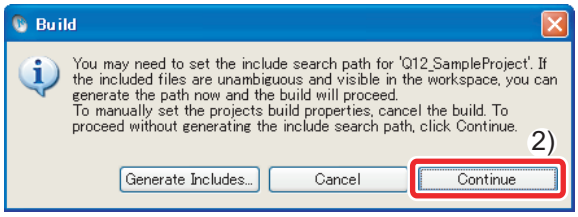
Convert (Build) the created program into a module that can be executed on a C Controller module.

Operating procedure

1) Right-click the created project in the "Project Explorer" window, and click [Rebuild Project].

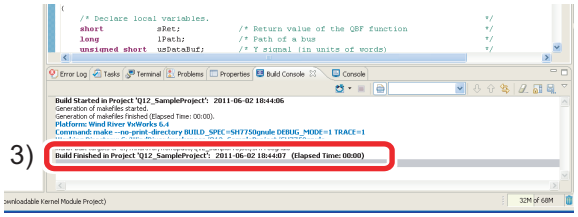


2) If the message shown below appears, click the Continue button.



The project starts to be built. The progress is displayed in the "Build Console" window.

3) Check that "Build Finished..." is displayed in the "Build Console" window.



"Build Finished..." indicates the completion of creation and build of the user program.

Point

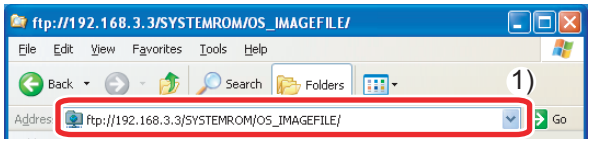
If "Build Finished..." is not displayed and an error occurs, check the error and correct the program.
After the correction, perform the operation again from "3) Generating an execution module from the user program"(P.37).

4) Connecting a C Controller module to CW Workbench

Connect a C Controller module to CW Workbench to perform debugging using CW Workbench.

Operating procedure

1) To acquire a VxWorks image file from the C Controller module, start Explorer and enter the following address in the address area.
ftp://192.168.3.3/SYSTEMROM/OS_IMAGEFILE/



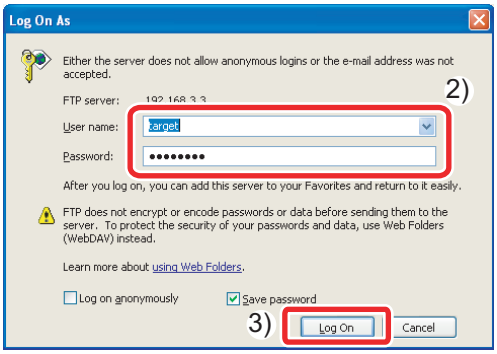
The "Log On As" window appears.

Point

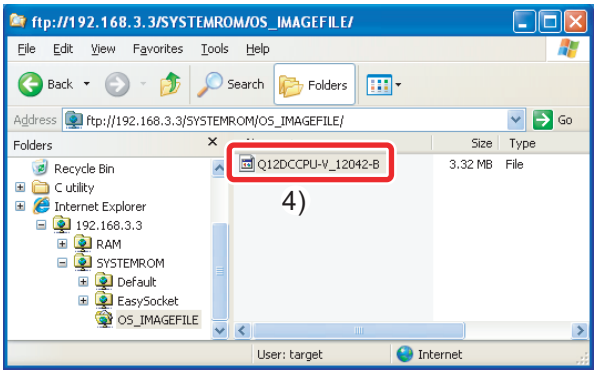
To communicate between the C Controller module and the personal computer, specify the same VxWorks image file for both.

2) Enter the following user name and password in the "Log On As" window.
   - User name : target
   - Password : password

3) Click the Log On button.



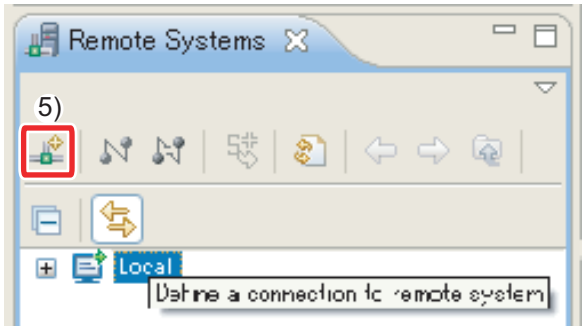
4) Copy the VxWorks image file stored on the C Controller module to "C:\MELSEC\CCPU\DVx\Tools".



Point

The "C:\MELSEC\CCPU\DVx\Tools" folder is created when SW□PVC-CCPU has been installed on "C:\MELSEC".

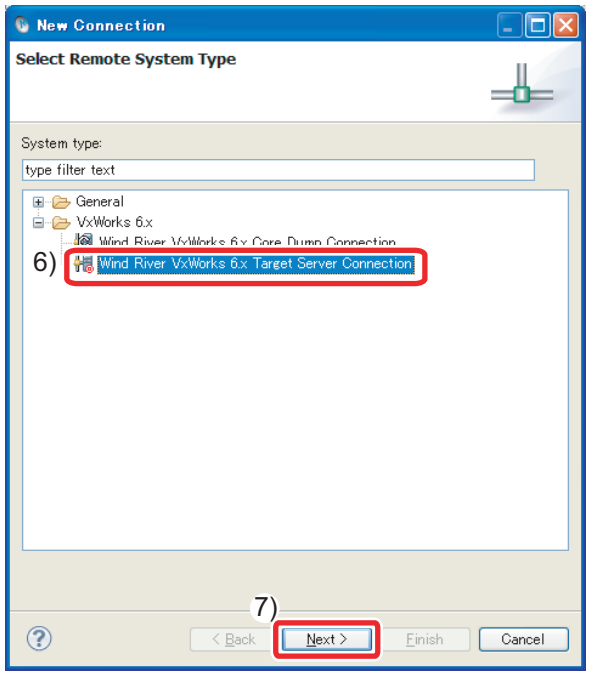
5) Click in the "Remote Systems" window.



The "New Connection" window appears.

6) Select "Wind River VxWorks 6.x Target Server Connection" in the "New Connection" window.

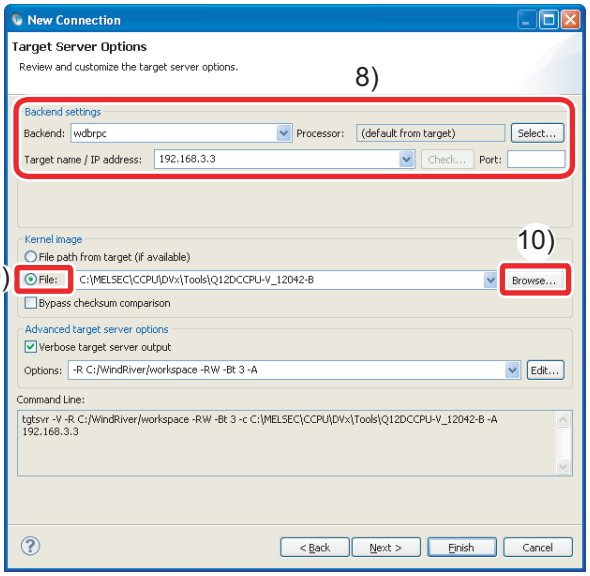
7) Click the Next > button.



8) Set the following items in "Backend settings".
   • Backend : wdbrpc
   • Processor : SH7780 (Click the Select... button and select the processor.)
   • IP address : 192.168.3.3 (default)
   • Port : Blank

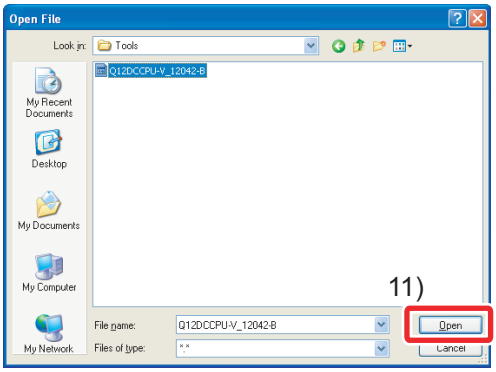
9) Select the "File" radio button in "Kernel image".

10) Click the Browse... button.

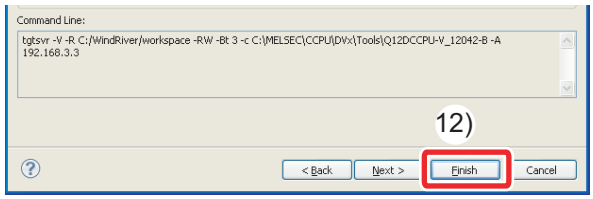


The "Open File" window appears.

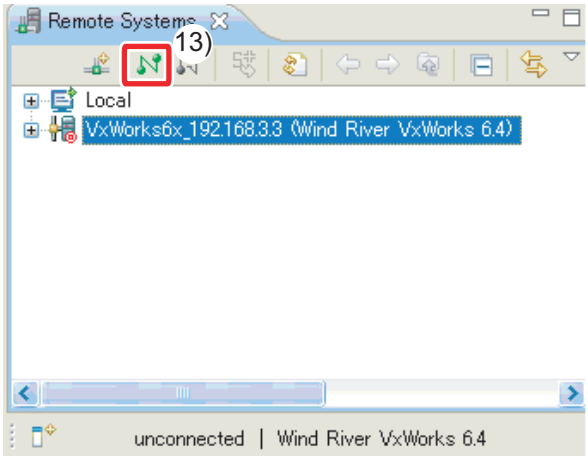
11) Select the VxWorks image file copied in the step 4) (C:\MELSEC\CCPU\DVx\Tools) from the tree view, and click the Open button.



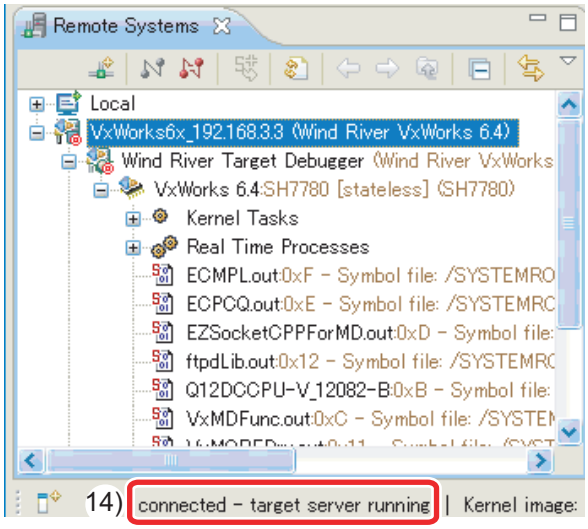
12) Click the Finish button.



13) Select the target server added in the "Remote Systems" window, and click .



14) After is clicked, the connection is completed when "connected - target server running" is displayed at the bottom of the "Remote Systems" window.



Point

If "connected - target server running" is not displayed, check that the C Controller module is normally powered on, and perform the operation again from "4) Connecting a C Controller module to CW Workbench"(P.38).

5) Debugging the user program

Check that the created program correctly operates.

1. Downloading the user program on the C Controller module

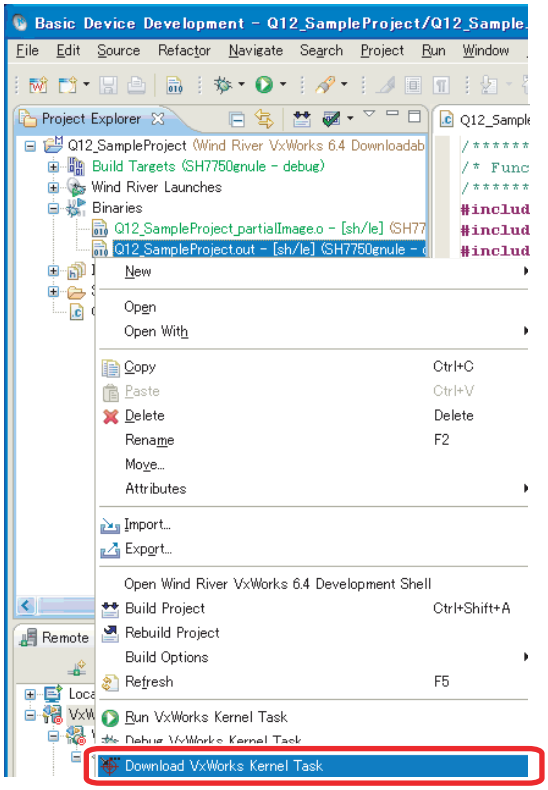
To debug the user program, download the execution module on the memory in the C Controller module.

Downloading a user program allows users to execute the program without a script file.

Terminology

Script file: A file that describes the download location and the startup procedure of the user program that starts at the start of a C Controller module

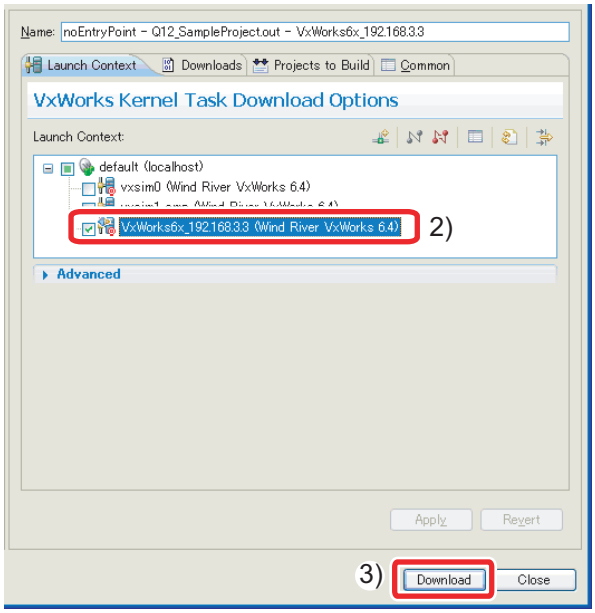
1) Right-click the created module file "Q12_SampleProject.out" in the "Project Explorer" window, and click [Download VxWorks Kernel Task].



The "Download Configurations" window appears.

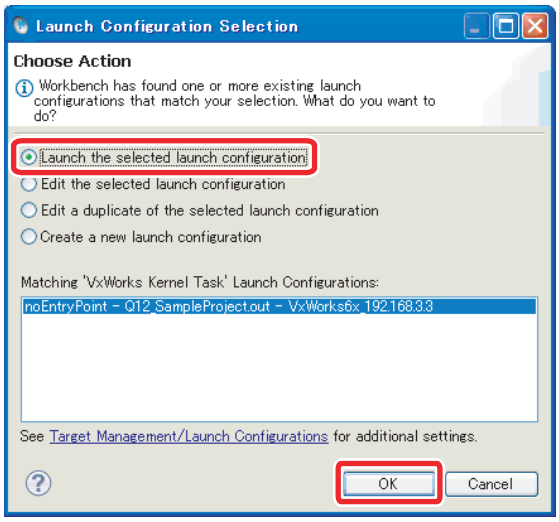
2) Select the "VxWorks6x_192.168.3.3 (Wind River VxWorks 6.4)" check box only in "Launch Context:".

3) Click the Download button.



Point

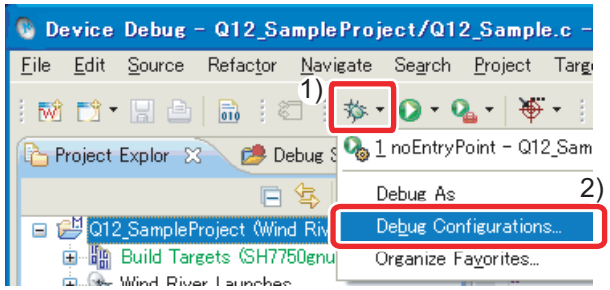
The "Launch Configuration Selection" window appears on and after the second operation of the step 2).
Select the "Launch the selected launch configuration" radio button and click the OK button.



2. Debugging the user program

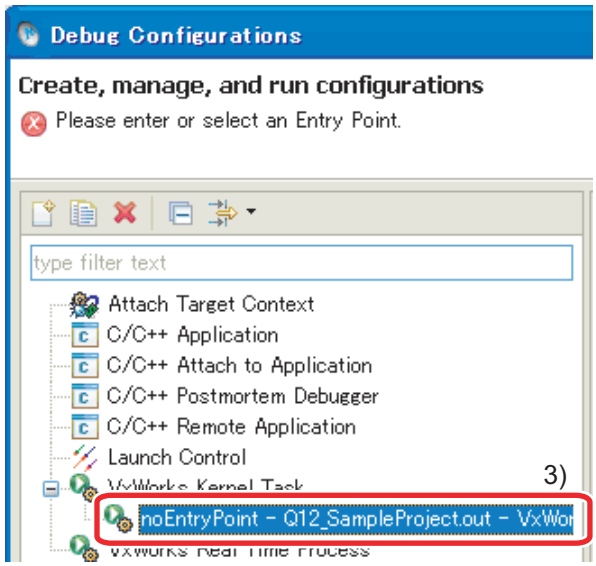
1) Select the created project in the "Project Explorer" window, and click ▼ on the right side of ⚙ on the toolbar.

2) Click [Debug Configurations...].



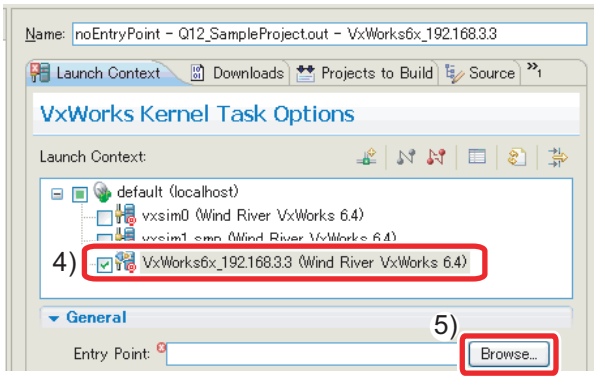
The "Debug Configurations" window appears.

3) Click the downloaded module "Q12_SampleProject.out" from "VxWorks Kernel Task".



4) Select the target server indicating connection to the C Controller module.

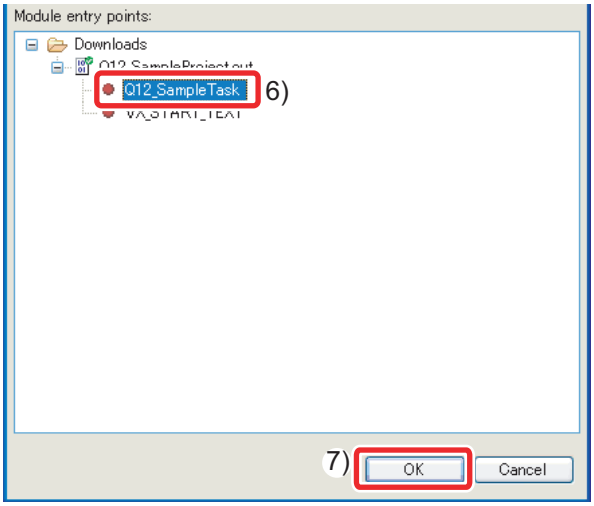
5) Click the Browse... button.



The "Entry Points" window appears.

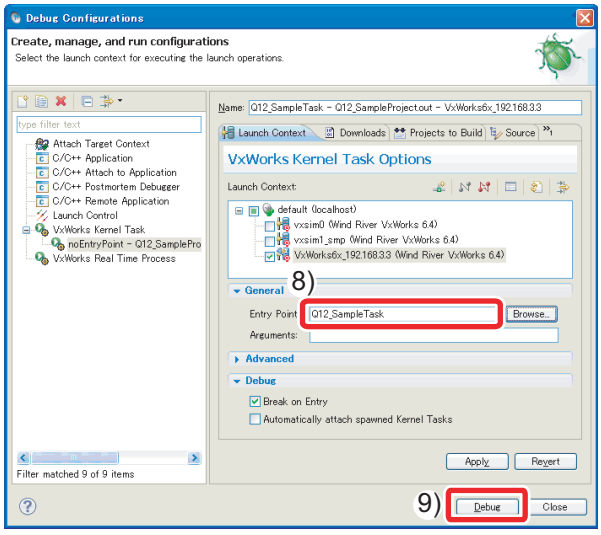
6) Select the function that starts debugging (Q12_SampleTask).

7) Click the OK button.

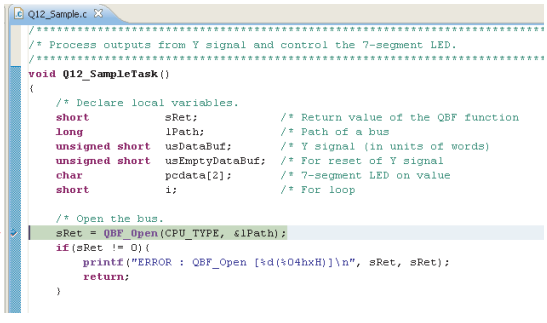


8) Check that the function name selected in the step 6) has been selected in "Entry Point:".

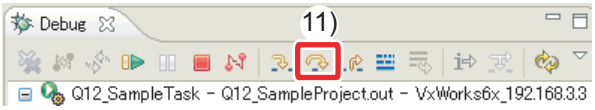
9) Click the Debug button.



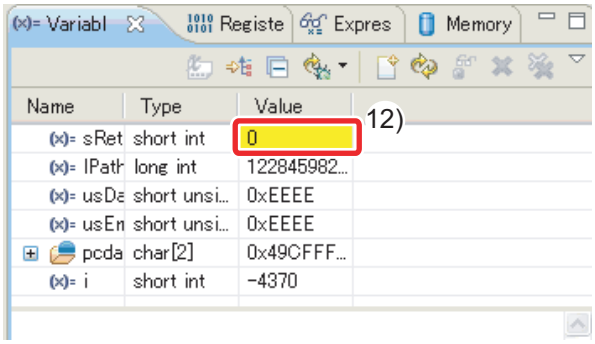
10) Debugging starts. Program execution stops at the start of the function specified in "Entry Point:".



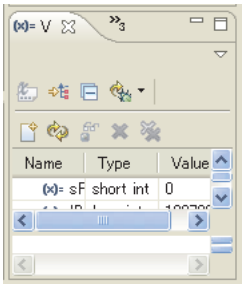
11) Click in the "Debug" window to perform debugging by one step.



12) By clicking a tab on the bottom right of the "Variables" window*1. variable values can be checked and changed.
In this step, check that "sRet", return value of the "QBF_Open" function, is "0" (normal value).



*1 Depending on a personal computer, the "Variables" window appears as shown below. Adjust the window size.



In the steps 11) and 12), debug the entire program.

Reference

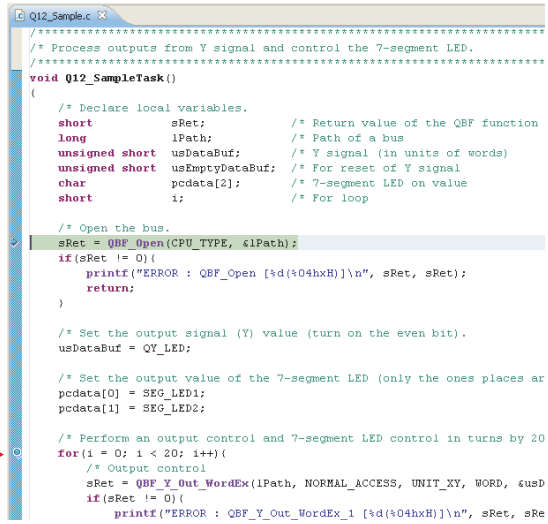
If the return value of the bus interface function is other than "0", troubleshoot with reference to the following.

- Bus interface function help window in SW□PVC-CCPU
- C Controller Module User's Manual (Hardware Design, Function Explanation): SH-080766ENG

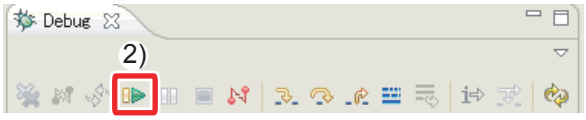
<Debugging using breakpoint>

As well as debugging in units of one step described in the step 11) shown to the left, debugging using a breakpoint is available.

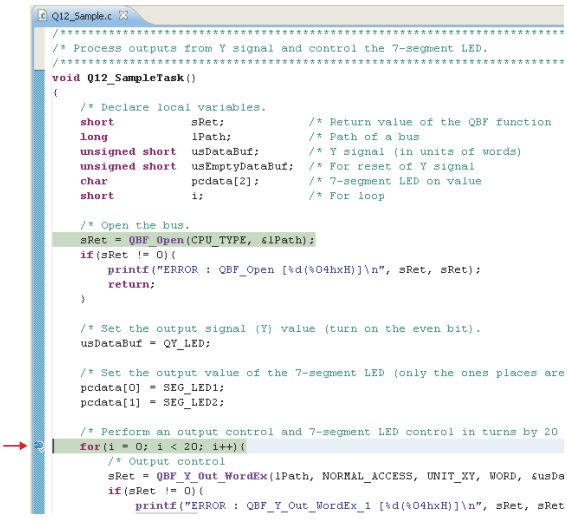
1) Double-click the left edge of a source file window and insert a breakpoint.



2) Click .



The program is executed at the position specified by the breakpoint.



Reference

The descriptions of icons are as follows:

: Step Into
Steps into the called function and stops at the first line of the function.

: Step Over
Executes the current line of the function and then stops at the next line of the function.

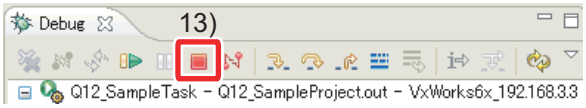
: Continues execution until the current function has returned to its caller.

: Executes a program.

: Stops a program.

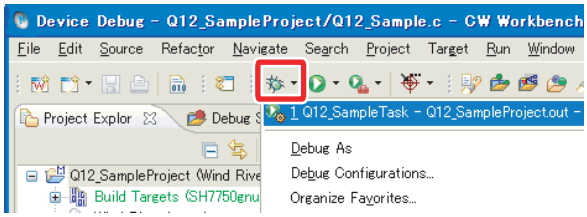
: Ends debugging.

13) Click in the "Debug" window to terminate the debugging session.



Point

To start debugging again, click ▼ on the right side of on the toolbar and select the created debug configuration at the top of the pop-up menu.
The steps 1) to 10) can be skipped.



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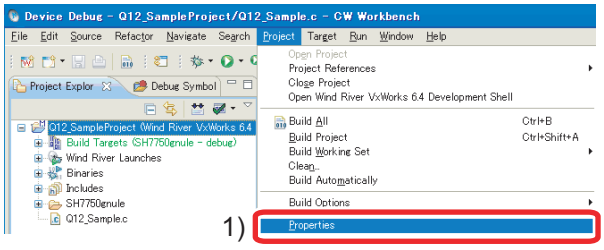
6) Registering an execution module

Build the created program for operation and store the created module on the C Controller module.

Operating procedure

1. Building the user program

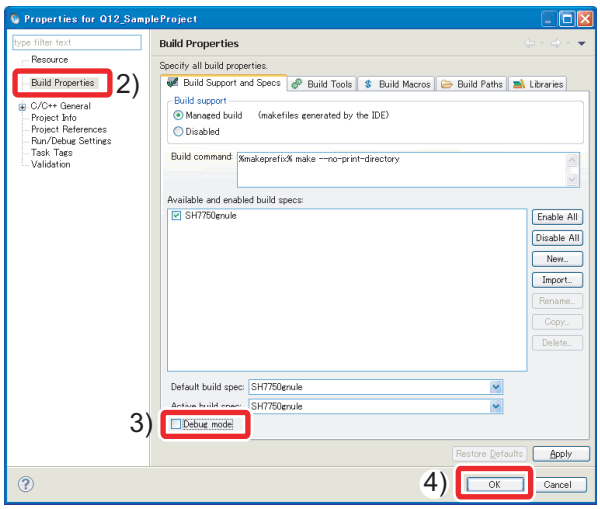
1) Select the created project in the "Project Explorer" window, and click [Project]→[Properties].



2) Select "Build Properties" from the tree view to the left in the window.

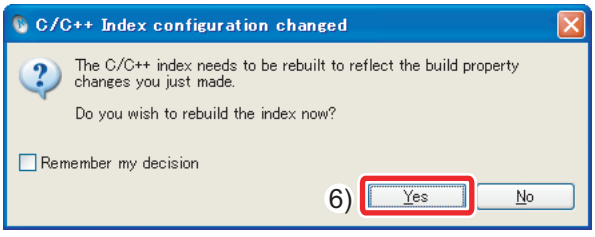
3) Clear the "Debug mode" check box.

4) Click the OK button.



5) Build the program following the procedure shown in "3) Generating an execution module from the user program"(P.37).

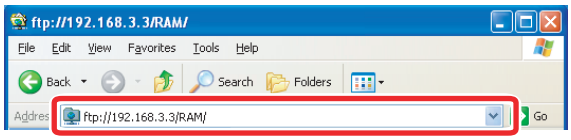
6) If the following message appears, click the Yes button.



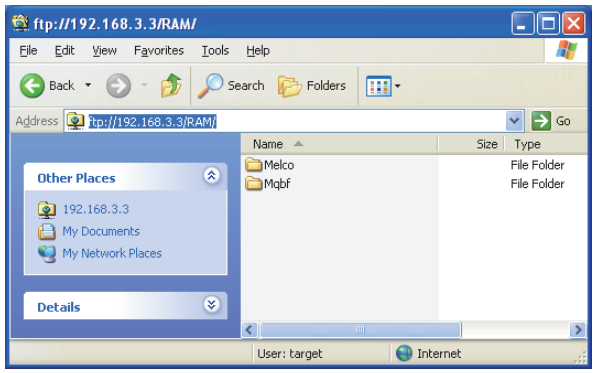
2. Storing the user program

1) Start Explorer and enter the following address in the address area for the C Controller module.

ftp://192.168.3.3/RAM

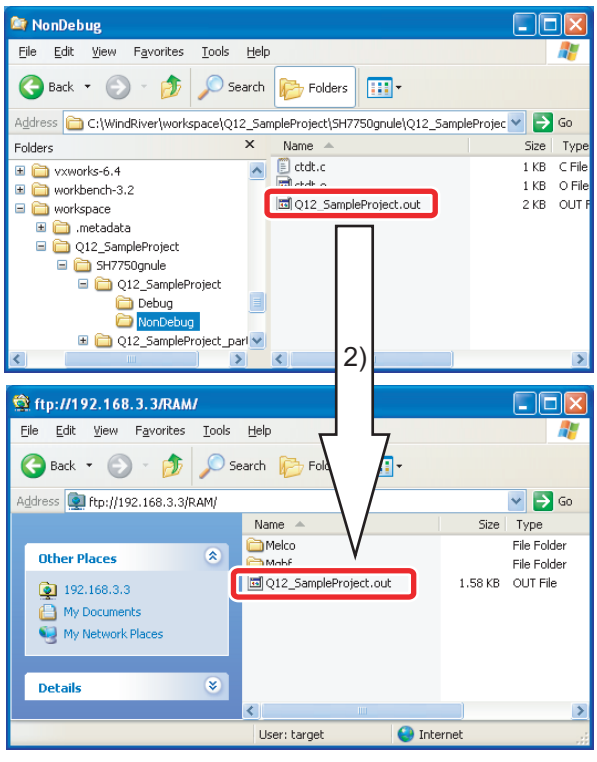


After login to the C Controller module, the address is displayed as shown below.



2) Copy the created user program "Q12_SampleProject.out" on the standard RAM for the C Controller module by drag and drop.
The user program created in this guide is stored on the following:

C:\WindRiver\workspace\Q12_SampleProject\SH7750gnule\Q12_SampleProject\NonDebug



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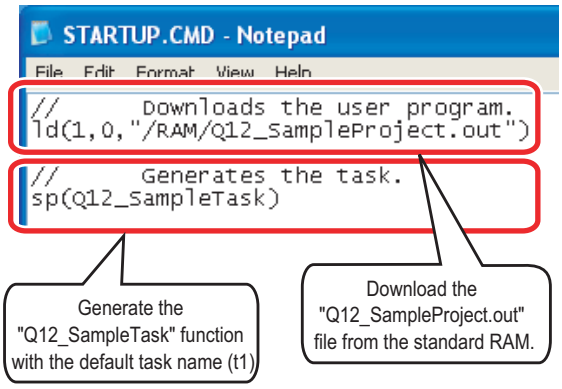
3. Creating and storing a script file

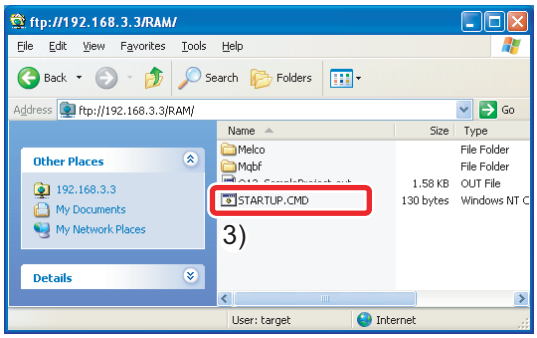
Create a script file that automatically downloads the execution module at the start of the C Controller module.

1) Open a text file and describe a script file that downloads the user program and generates the task as shown below.



2) Name the file as "STARTUP.CMD" and save the file.

3) Copy the created script file on the standard RAM of the C Controller module.
ftp://192.168.3.3/RAM



The script file has been created and stored.

Point

A user program and a script file can be stored on the CompactFlash card as well. When a script file is stored both the standard RAM and the CompactFlash card, one on the CompactFlash card is started by priority.

<6> Checking Operations

Execute the program registered with the C Controller module and check operations.

Use the "RUN/STOP/MODE" and "RESET/SELECT" switches on the front of the C Controller module.

[Functions of the "RUN/STOP/MODE" switch]
- RUN : Enables outputs (Y) and writing to the buffer memory from a user program
- STOP : Disables outputs (Y) and writing to the buffer memory from a user program
- MODE : Used for the hardware self-diagnostic function

[Functions of the "RESET/SELECT" switch]
- RESET : Resets hardware and programs.
- SELECT : Used for the hardware self-diagnostic function

Point

The C Controller module executes program operation regardless of the switch status (RUN/STOP).

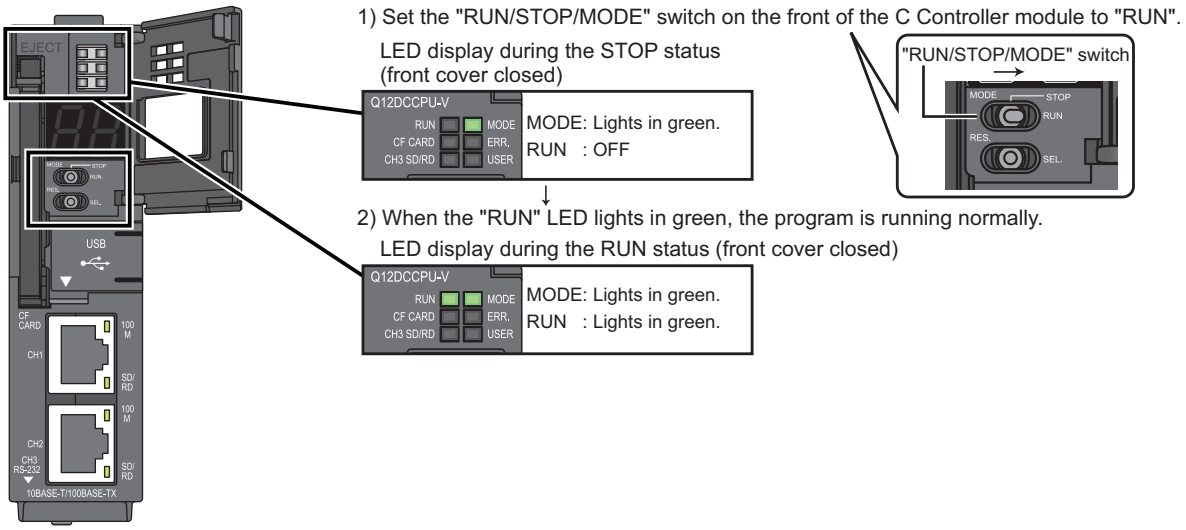
Reference

For details on the "RUN/STOP/MODE" and "RESET/SELECT" switches, refer to the following.

☞ C Controller Module User's Manual (Hardware Design, Function Explanation)
: SH-080766ENG

Operating procedure

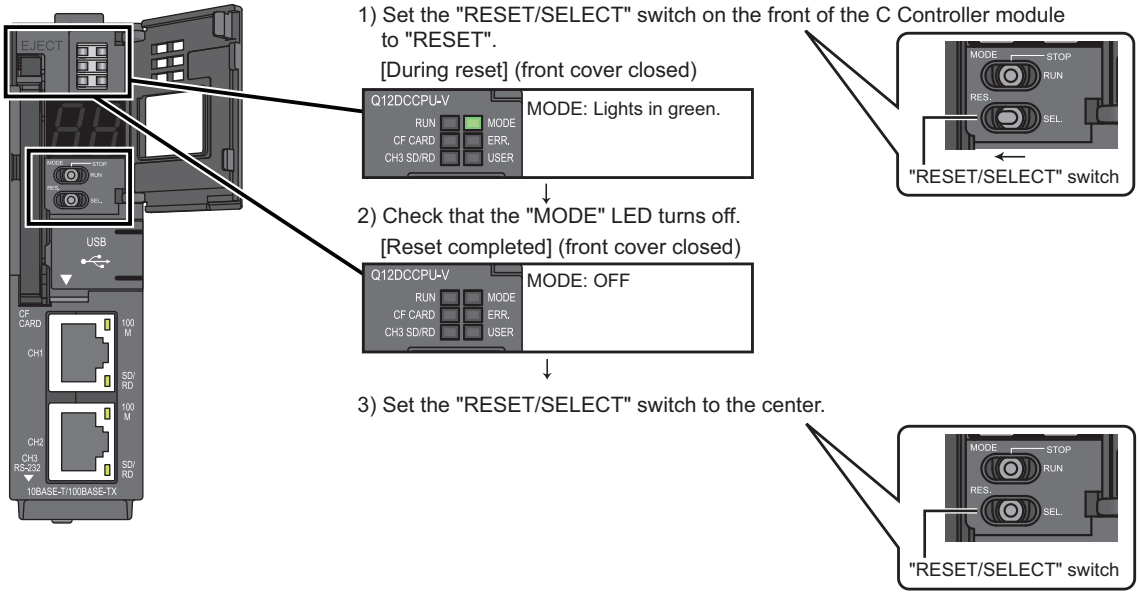
1. Enable outputs (Y) from the user program.



Point

To disable outputs (Y) from the user program, set the "RUN/STOP/MODE" switch to "STOP".

2. Reset the C Controller module.



Reference

If the "ERR." LED turns on or starts flashing, troubleshoot with reference to the following.

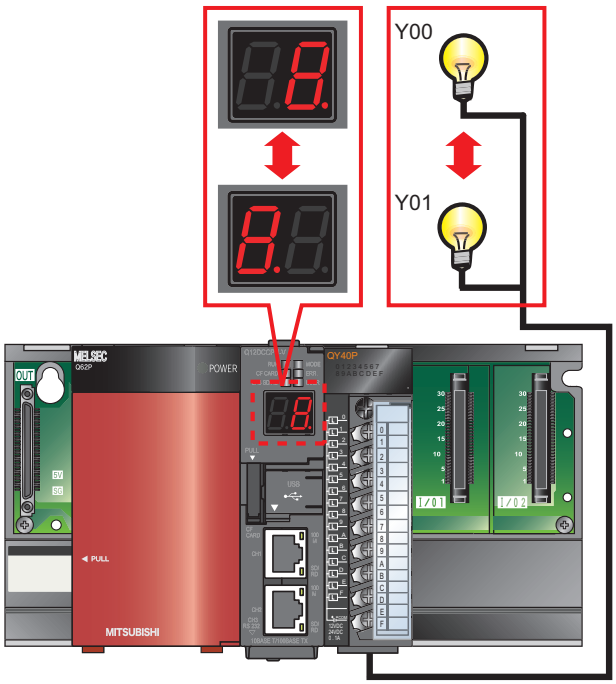
☞ C Controller Module User's Manual (Hardware Design, Function Explanation)
: SH-080766ENG

3. Use the 7-segment LED and lamps to check operations.

The 7-segment LED on the front of the C Controller module and output lamps operate as follows:

1) The tens place and ones place of the 7-segment LED alternately turn on by 20 times.

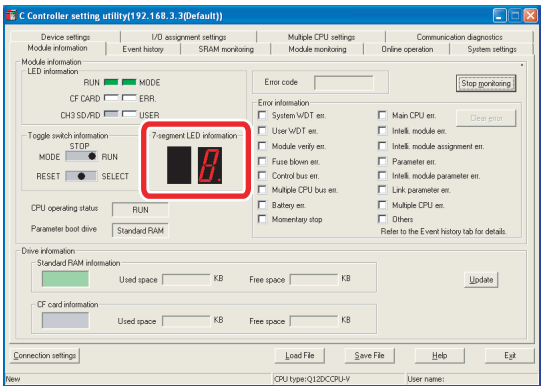
2) Synchronizing with the 7-segment LED, output lamps Y00 and Y01 alternately turn on.

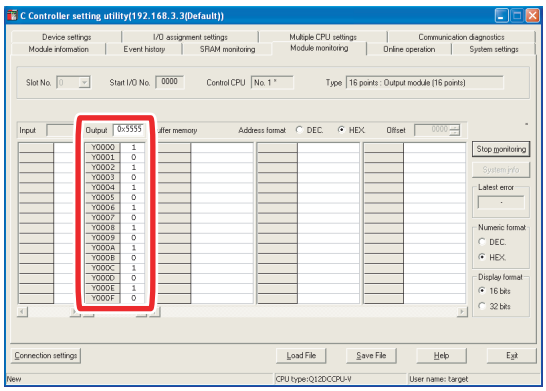


3) To check the operations again, reset the C Controller module.

Reference

Status of the 7-segment LED and the output lamps also can be checked on C Controller setting utility. (P.52)





FREQUENTLY-USED FUNCTIONS

This chapter describes functions frequently used for the start-up and the maintenance after operation of a C Controller system.

<1> Checking Errors and Taking Corrective Action

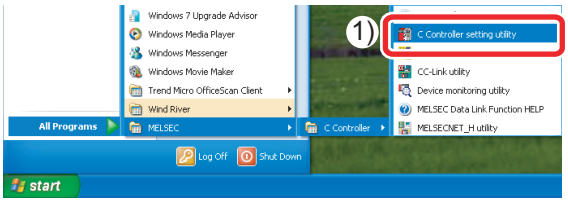
An error can be checked and the corrective action can be taken using C Controller setting utility.

1) How to check an error and take corrective action

Operating procedure

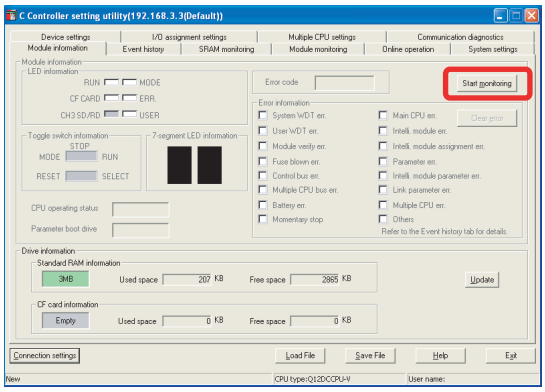
1. Checking for error <Module information>

1) Select[start]→[All Programs]→[MELSEC]→[C Controller]→[C Controller setting utility].



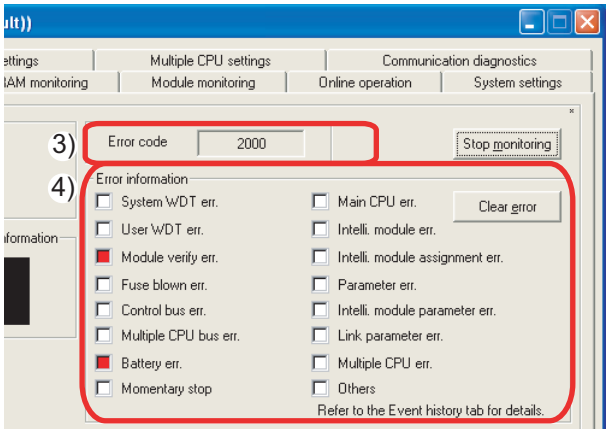
C Controller setting utility starts.

2) Click the Start monitoring button on the "Module information" tab.



3) An error code is displayed in the window.

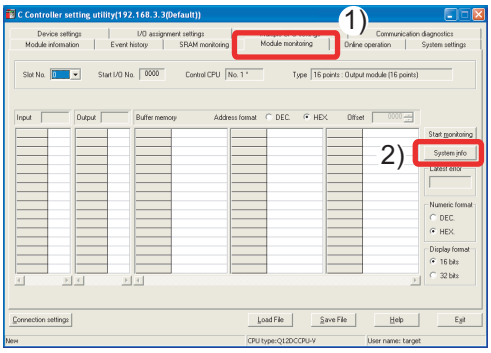
4) The check boxes of the current errors color in red ( ).
The error code is kept updated during monitoring.



2. Checking the error cause and the corrective action <Module monitoring>

1) Click the "Module monitoring" tab.

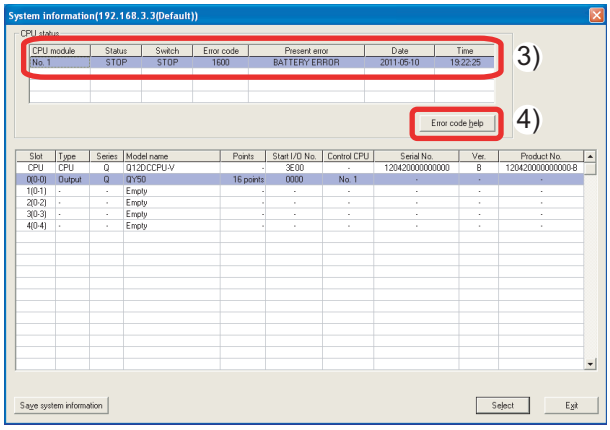
2) Click the System info button.



The "System information" window appears.

3) The current error is displayed in the window.

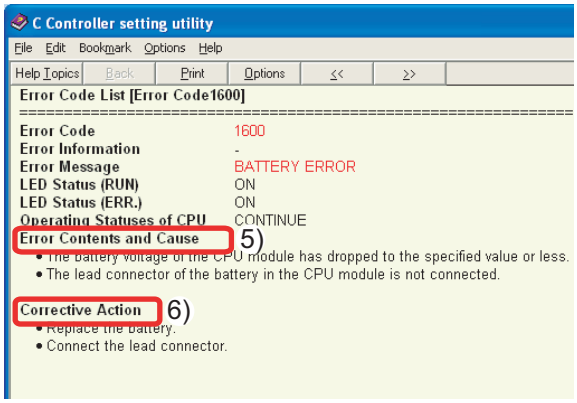
4) Click the Error code help button.



The help window for the current error appears.

5) Find the possible cause from "Error Contents and Cause".

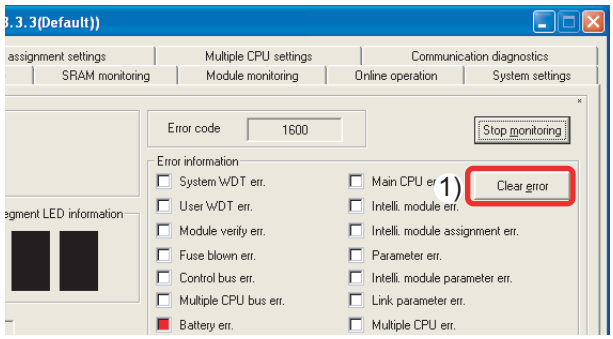
6) Take corrective action with reference to "Corrective Action".



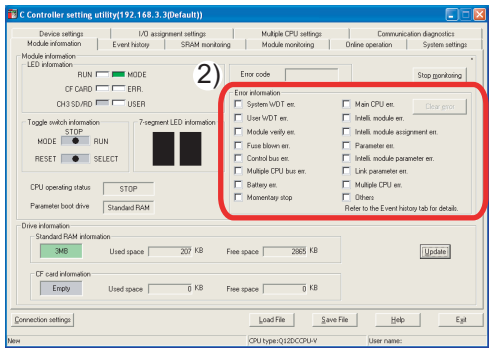
3. Clearing the error after taking the corrective action

(1) When the "ERR." LED of the C Controller module is on

1) Click the Clear error button in the "Module information" tab.



2) Check that the error has been cleared.



(2) When the "ERR." LED of the C Controller module is flashing

After taking the corrective action, reset the C Controller module.

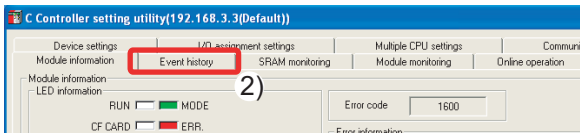
2) Checking error history

Errors occurred up to the present and the error details can be checked.
When and what kind of error occurs can be checked, useful in error analysis.

Operating procedure

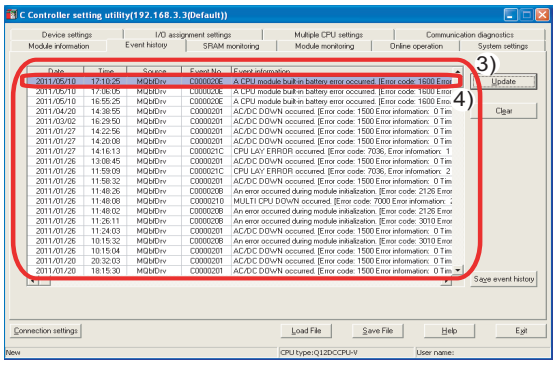
1) Start C Controller setting utility.

2) Click the "Event history" tab.



3) Error history and the error details are displayed.

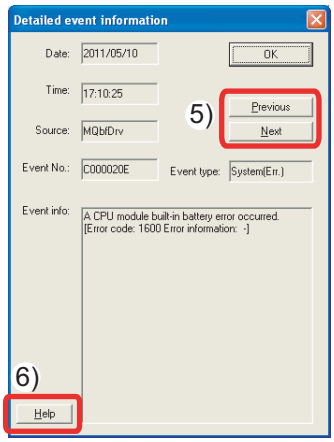
4) To see more details of an error, double-click the error.



The "Detailed event information" window appears.

5) Clicking the Previous or the Next button will display the details of the previous or the following error.

6) Clicking the Help button will open the help window on the error.



6
〈1〉

<2> Monitoring Module Status and Testing Operations

Module I/O status and buffer memory status can be checked through C Controller setting utility. I/O status can be checked and operations can be tested at start-up and maintenance.

1) Checking module I/O status and buffer memory status

The input (X) and output (Y) status of the module and buffer memory status can be monitored.

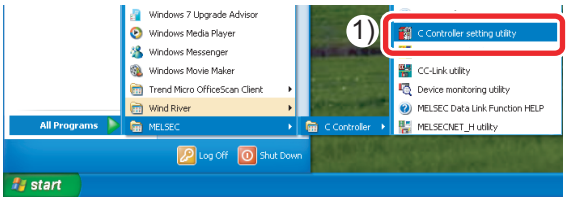
Terminology

Buffer memory: The memory of an intelligent function module (module such as A/D conversion module and D/A conversion module having a function other than input and output) used to store data (such as setting values and monitored values) for communication with a C Controller module

Operating procedure

1. Start C Controller setting utility.

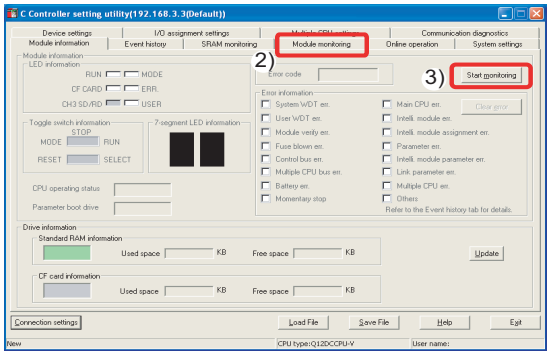
1) Select [start]→[All Programs]→[MELSEC]→[C Controller]→[C Controller setting utility].



C Controller setting utility starts.

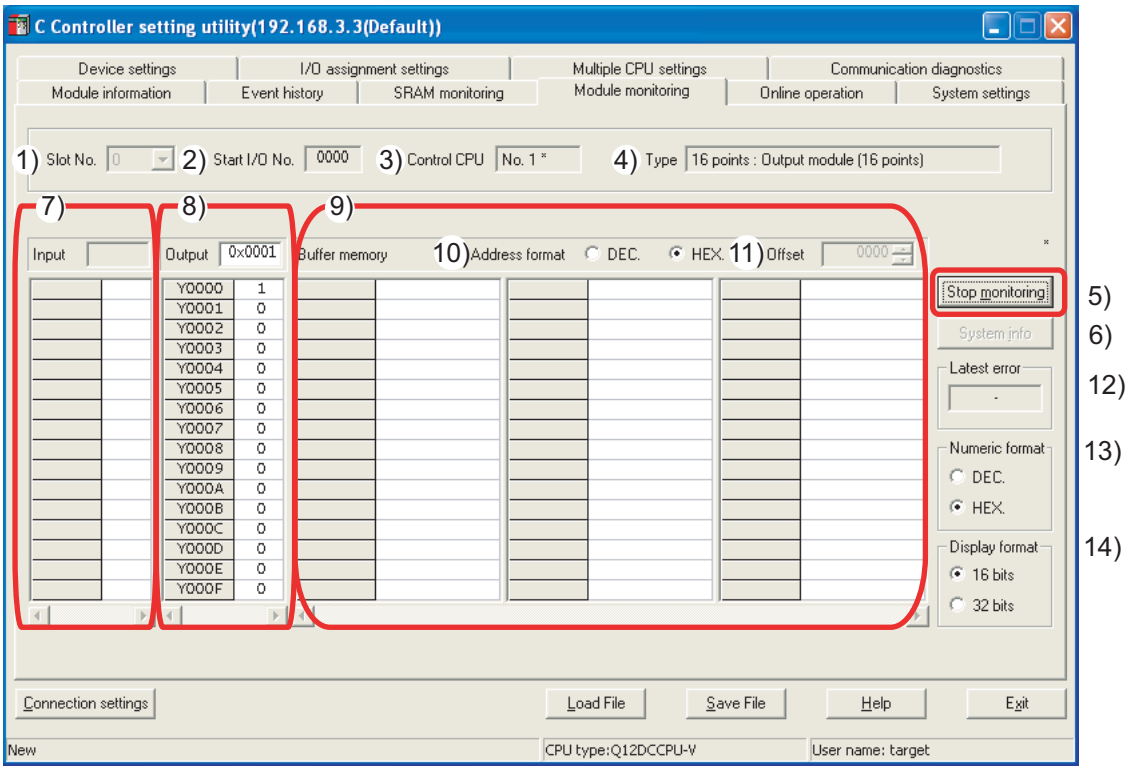
2) Click the "Module monitoring" tab.

3) Click the Start monitoring button.



The "Module monitoring" window appears.

2. Check the "Module monitoring" window.

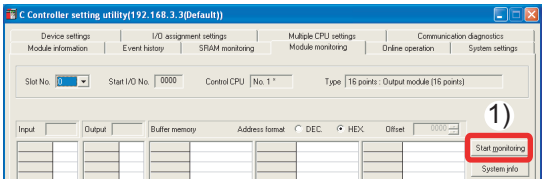


No.	Name	Description
1)	Slot No.	Specify a slot No. to be monitored.
2)	Start I/O No.	Displays the start I/O No. of the module mounted on the slot specified in 1).
3)	Control CPU	Displays the CPU No. that controls the module mounted on the slot specified in 1). When C Controller setting utility is connected to the C Controller module that serves as a control CPU, "*" appears on the right of the CPU No.
4)	Type	Displays the number of I/O points and the type of a module when a module other than a CPU module is mounted on the slot specified in 1).
5)	Start monitoring button, Stop monitoring button	Starts or stops monitoring of the C Controller module. "*" flashes in the upper right of this button during monitoring.
6)	System info button	Displays the "System information" window.
7)	Input	Monitors the input (X) of the module mounted on the slot specified in 1). 0: OFF 1: ON
8)	Output	Monitors the output (Y) of the module mounted on the slot specified in 1). 0: OFF 1: ON
9)	Buffer memory	Monitors a buffer memory when an intelligent function module is mounted on the slot specified in 1).
10)	Address format	Select a numeric format for "Offset".
11)	Offset	Specify the address of a buffer memory area to be monitored.
12)	Latest error	Displays the error code of the latest error occurred in an intelligent function module.
13)	Numeric format	Select a numeric format for a buffer memory or a CPU shared memory.
14)	Display format	Select a display format for a buffer memory or a CPU shared memory.

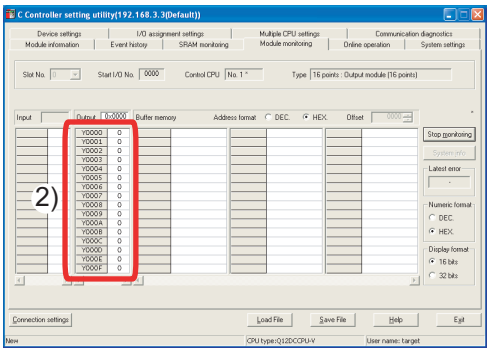
2) Testing operations by forced output

Module operations can be tested by forced output from an output (Y).
The following describes the procedure for forced output.

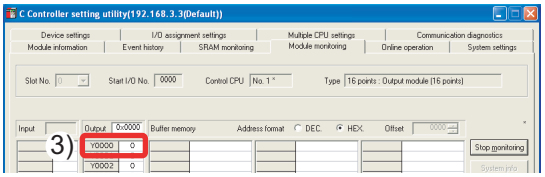
1) Click the Start monitoring button in the "Module monitoring" window.



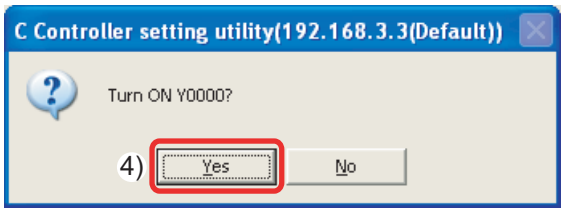
2) Check the output status.



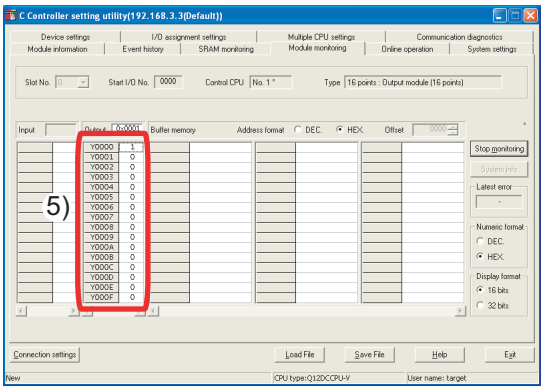
3) Double-click the output (Y) from which forced output is executed.



4) The confirmation window appears.
Clicking the Yes button will execute forced output from the output (Y).



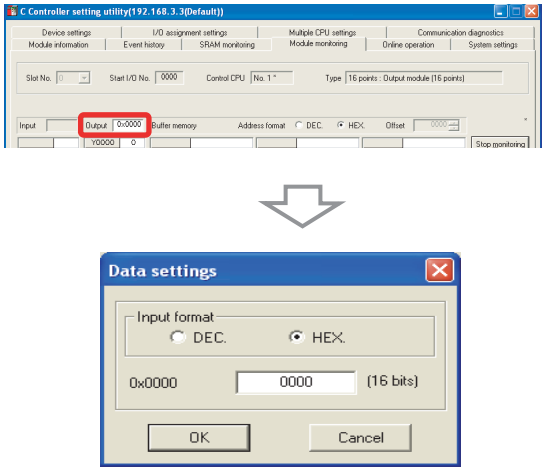
5) Check the output status.



The LED of the output module turns on.

Reference

Double-clicking an item under "Output" will open the "Data settings" window. Outputs (Y) can be batch-selected by specifying a numeric value.



Point

An operation test by forced write to a buffer memory can be executed in the same manner.

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